KNOWLEDGE
AN ILLUSTRATED
MAGAZINE OF SCIENCE
PLAINLY WORDED—EXACTLY DESCRIBED

LONDON: FRIDAY, AUGUST 28, 1885.

CONTENTS OF No. 200.

	PAGE
Americanisms. By R. A. Proctor	171
Mysteries and Moralities. V. By Edward Clodd	172
Pleasant Hours with the Microscope. (*Illus.*) By H. J. Slack	174
Finding the Way at Sea. By R. A. Proctor	176
Rambles with a Hammer. By W. Jerome Harrison	177
Final Operations for the Removal of Flood Rock. (*Illus.*)	178
Tricycles in 1885. (*Illus.*) By J. Browning	180
Face of the Sky. By F.R.A.S.	181
Gossip. By Richard A. Proctor	182
Reviews	183
Correspondence: Magnification near Horizon — "Doubling up your Haves" — Mispronunciation — Thought-induction — Mental Development—Mean-time Sundials —The Retinal Decomposition of Light—Oil-gland in Duck—Swans Flying—Tricycle Query—Musical Temperament, &c.	185
Our Inventors' Column	190
Our Chess Column	191
Our Whist Column	192

AMERICANISMS

(*Alphabetically arranged*).

By Richard A. Proctor.*

Abrogans or *Abergoins* is the Western way of calling the natives or Aborigines.

Absquatulate signifies to run away. It is now less often heard than of yore, having been replaced in some degree by the word "skedaddle."

Account, "of no account" is an American way of expressing worthlessness. *No account* becomes an adjective: "no account men," Bret Harte says, meaning worthless fellows.

Admire. To wonder at. Often used with at. "I admire at that," for I wonder at that. The expression is good old English.

After night, in the middle States, means "after nightfall."

All-fired, a polite form for Hell-fired,—the meaning is not mistakable.

All to pieces, and *all to smash* signify "utterly."

Allow. To assert, affirm, or merely to express an opinion. This expression is often put by English writers in the mouths of Yankees; but as a matter of fact it is only used in the Southern and Middle States.

Along. "Get along" is used in America where in England we should say "get on."

Anan. Leatherstocking's expression. I have only heard this once,—at an eating house in Pittsburg. The expression is used in Pennsylvania.

Ante. To *ante* a sum, is to risk it. The expression belongs to a game called poker, much played by the lower class of gamblers, horse-thieves, politicians, cowboys, and the like.

Anything else, Not,—meaning "just that." If an American is asked whether some one really did such and such a thing, and he wishes to emphasise his reply, he will say, "He didn't do anything else."

Apple Brandy and *Apple Jack.* A strong liquor fermented from apple juice.

Approbate, is sometimes used in America—incorrectly, of course—for "approve."

Arkansas Toothpick. A bowie-knife, with closing blade. I have never seen an American pick his teeth with an Arkansas Toothpick; but I can believe *anything* about tooth-picking in America. The public display of such arrangements as any American finds desirable for his or her teeth must be regarded as a national institution. In England a man will endure some pain rather than pick his teeth in public. In America, scarcely anyone, man woman or child, deems it necessary to refrain. Americans rather seem to rejoice in the performance. Possibly it may be thought something to be proud of to have teeth left to pick,—after much eating of hot biscuits and hot cakes. Or it may be regarded as an expression of independence. If so, America, thus judged, must be regarded as *very* free—and easy.

Around. "To be around" is used in America for "to be near" or "by." Thus a preacher in America spoke of Mary as "standing *around* the cross."

As, for "that." "I don't know as I shall go there," &c. "Only heard among the illiterate" says Bartlett; but I imagine that nine out of ten whom I have heard use this ungrammatical expression would be offended if they were described as illiterate. I have heard college professors use it freely.

At is sometimes used for "in," as "at the north" for "in the north."

At that, an odd expression used to intensify something already said, as "He is a Methodist and a hypocrite *at that;*" "he has an ugly wife and a shrew at that." Probably an abbreviation of "added to that."

Awful, used for "very," is purely American, though *awful*, used wrongly as to meaning but rightly as to grammar, is now common enough in England. In the Eastern and Middle States one often hears "awful handsome," "awful hungry," and so on.

Ax, To (for to ask), is a Yankee relic of a very old English word, still used in many parts of England.

Back of is used for "behind"; "you'll find the stick back of that box."

Back Down. To "back down" is to yield.

Back Out, To. To retreat.

Back track. "To take the back track," is to retreat.

Backwoods, the woods behind or "back" of cleared land.

Bad lands. Waste lands unfit for any sort of agriculture, and hard to travel through. The French settlers called this *Mauvaises terres*, a name still remaining in the form "Movey star."

Bad. Constantly used for the adverb "ill" or for "badly." I feel bad, is not in America an admission of moral depravity, but means simply I don't feel well. So, "I feel good" is not Pharisaic, but means I am well and happy. "Drink that wine, it will make you feel good," would mean that the drinker will feel jolly after his draught. Where something nice, though (conventionally perhaps) naughty is referred to, the expression "it will make you feel good" has a singularly odd sound in English ears. See *Chemiloon* (the reference is all right, perplexed reader).

Baggage, is used in America where we say "luggage." The word "baggage" in England has often another meaning. "To say that a man had a little baggage" with him might be misunderstood in England. A story

* I have taken as my chief but by no means my sole authority Bartlett's "Dictionary of Americanisms." I should be obliged to any correspondents who may note omissions or corrections.

is told of an English wife in America being told that her husband had arrived with "a little baggage": She went to look for that little baggage with a potato-masher.

Baggage-smasher, the name very appropriately given to the persons who move baggage to and from cars, &c.

Balance, the rest. "Peter and Andrew, with the balance of the twelve, stood around."

Bang-up. First-rate.

Bankit. I heard this expression once only, in New Orleans, for side-walk. (Fr. *banquette*.)

Bay, The Bay State, is Massachusetts. "Let the grand old Bay State proudly," said Lowell, "put the trumpet to her lips," &c., saying "you go one way we go t'other, guess it wouldn't break our hearts,"—an early cry for Secession,—forgotten subsequently by the North. But the South maintain still that the Northern states were the first to secede from the Union, by failing to adhere to the constitution.

Bayou. The outlet of a lake.

Bear State. The State of Arkansas, so named from its more characteristic inhabitants.

Beat. As a verb, to surpass. "That beats all ever I heerd." Also to astonish, to overcome. "That beats me," means that is utterly surprising to me. But "I'm dead beat" means I'm thoroughly tired.

Beat as a noun also has two meanings. It means some thing or person surpassingly good or effective or surprising, as, "I never saw the *beat* of that." But a "beat" is also one who is thoroughly exhausted, generally in pocket. A "dead beat" is for instance a man without a cent, and not willing to earn a cent.

Bed-spread. A coverlet or counterpane.

Bee. A gathering of friends and neighbours to get through work for a person or family.

A *spelling-bee* is a gathering to test skill in spelling, and tolerably dreary such gatherings are. *Crede experto*.

Bee-line. A straight line,—where in England we should say "as the crow flies," an American would say "on a bee-line."

Being as, an elegant way of saying "since" or "because." "Being as you're a friend," would mean, since you are a friend, or considering that you are.

Beliked, for liked: probably as justifiable in reality, though not by English usage, as "beloved" for "loved."

Belongings, used sometimes for property, but occasionally as a euphemism for trousers, a "gentleman's belongings."

Bender. To "go on a bender" is to start on a frolic. An unbender would seem nearer the mark.

Best. Used as a verb, meaning to get the better of.

Betterments. Improvements. *Bettermost*, for the best.

Biddy. An Irish female servant.

Big. Used not only for "large," but for fine or excellent, as "big whisky" for whisky of first-rate quality.

Big bugs. Persons of consequence.

Big meeting. A term applied to camp-meetings, gatherings of people for religious services of the sensational or hysteric kind, a custom invented by the coloured people, but known also in the wilder parts of Ireland. Commercial persons in America find it good business, I am told, to attend these religious gatherings,—they get a holiday and credit for being more religious than those who keep away.

Biling, also *Bilin'*. A set. "I'd pizen the hull bilin' of yer, if I'd my way," I heard a woman remark to a set of somewhat noisy persons who had annoyed her.

Biscuit. A biscuit in America means what we would call a hot roll in England. Some are much smaller than our hot rolls; but they are the same in character. They are indigestible to a degree; but Americans will assure you (with face dismally contradicting their words) that hot biscuits are good and healthy food.

Bishop. A "bustle,"—article of feminine gear.

Bit. I must admit great ignorance as to the real meaning of this word. In the South, a "bit" is generally half-a-quarter, *i.e.* 12½c., equal in value to our English sixpence; but I have known a quarter and a dime (25c. and 10c. respectively) called a "bit." I believe, however, a bit usually means 12½c.

(To be continued.)

MYSTERIES AND MORALITIES.

By Edward Clodd.

V.

IN the York series, the eighth and ninth pageants, in the Towneley and Chester, the third pageant, and in the Coventry, the fourth pageant, dramatise the building of the Ark and the Flood.

In the *Processus Noe cum filiis*,* the play opens with a long prayer by Noah, in which he recites the history of the world. God replies, repenting that he has made man, and, declaring his intention to drown the world, bids Noah build the ark and "stuf it with vitaylle." Noah tells the Deity, *sub rosa*, how his wife, like Mrs. Pepys, hath a temper of her own:—

> My wife wille I frast (ask) what she wille say,
> And I am agast that we get som fray
> Betwixt us both;
> For she is fulle tethde (ill-tempered)
> For litille oft angre,
> If any thyng wrang be
> Soyne (soon) is she wroth.

When Noah goes home to tell his wife this, she jeers him about his crochets, and says that he ought to be clothed in "Stafford blew," because he is always croaking.

> For I dar be thi borow (surety)
> From even unto morow
> Thou spekes ever of sorow,
> God send the onys (once) thi fille!
> We women may wary (curse) alle ille husbandes;
> I have oone, bi Mary! that lowsyd me of my bandes;
> If he teyn (grieve) I must tary how so ever its standes,
> With seymland (dissembling) fulle sory, wryngand both my hands
> For drede.
> *Noe*. We! hold thy tong, Ram-skyt, or I shalle the stille.
> *Uxor*. By my thryft, if thou smyte, I shalle turne the untille.
> *Noe*. We shalle assay as lyte (quick); have at the Gille,
> Apon the bone shal it byte.†

A short fight ensues, in which the wife gets the worst of it, and then Noah begins his task "in nomine Patris, et Filii, et Spiritûs Sancti, Amen," but none the less grumbling about his stiff back and aching bones. When the ark, which has been finished "in nomine Patris, et Filii, et Spiritûs Sancti,"‡ is ready, the wife refuses to enter.

> Sir, for Jack nor for Gille wille I turne my face
> Tille I have on this hill spon a space
> On my rok (distaff);
> Welle were he myght get me,
> Now wille I doune set me,
> Yit reede I no man let me,
> For drede of a knok.

* *Towneley Mysteries*, pp. 20–34. The term *processus* was applied to these plays on account of their exhibition in connection with the Corpus Christi procession.

† *Towneley Mysteries*, p. 25. ‡ *Ibid.*, p. 26.

Noe. Behold to the heven the cateractes alle,
That ar open fulle even, grete and smalle,
And the planettes seven left has thare stalle (place),
Thise thoners and levyn (thunders and lightnings) downe gar falle;
Therfor, wife, have done, com into ship fast.
Uxor. Yei, Noe, go cloute thi shone, the better wille thai last.

The sons' wives seek to persuade her, but in vain, and a second fight ensues, with the result that Noah groans

My bak is nere in two;

And his wife

And I am bet so blo.*

After which the termagant yields, and they enter the ark.

In the York play, Noah's wife is equally obstinate, flatly refusing to obey the message which he sends through his sons. "Telle him," she says, "I wol come no narre." When he himself would persuade her—

Come hedir faste, dame, I thee praye,

She answers

Trowes thou that I wol leve the harde lande
And tourne up here on toure deraye? (disorder)†

and, scolding him for not telling her sooner, gives him "a clowte," declaring she will enter the ark only on her "commodrys (gossips) and cosynes" coming with her, but in the end yields.

In the Coventry Series she is obedient and helpful, "a preacher of righteousness," but in the Chester she is the troublesome shrew of the York and Towneley variants.

After the patriarch and his sons have built the ark and caulked and "pyched" it, Noah adjures his wife by "Sante John" and in "Gode's name" to come in, but she answers—

Yea, sir, set up your sail,
And row forth with evil hail,
For withouten fail
I will not out of this town:
But I have my gossips every echone (one),
One foot further I will not gone;
They shall not drowne, by Saint John,
An I may save their life!
They loven me full well, by Christ!
But thou let them into thy chest,
Else row, row where thee leiste
And get thee a new wife.
Noah. Shem, son, lo! thy mother is wrawe;
By God, such another I do not knawe!
Shem. Father, I shall fetch her in, I trow,
Withouten any fail.
Mother, my father after thee send,
And bids thee unto yeinder ship wend,
Look up and see the wind,
For we ben ready to sail.
Noah's Wife. Shem, go again to him, I say;
I will not come therein to-day.
Ham. Shall we all fetch her in?
Noah. Yea, sons, in Christe blessing and mine;
I would you hied you betime,
For of this Flood I am in doubt.

As in the York play, Noah's wife refuses to go on board without her female friends, who, as her sons advance, join with her in singing the *Good Gossip's Song* ending with these lines:—

Here is a potill full of Malmsee full strong,
It will reioyce both harte and tonge;
Though Noe thinke us never so longe
Here will we drinke alike.

At last the three sons force her in "whether," as Shem says to her, "thou wilt or not," and as she is pulled in, Noah says to her—

Welcome, wife, into this boat,

Upon which she gives him a box on the ears, answering,

Have then that for thy note (noddle),

And Noah cries:

Ha! . . . ha! . . . Marry, this is hot!
It is good for to be still.*

In the only relic of the Newcastle-on-Tyne pageants, the play of "Noah's Ark," performed by the shipwrights, the devil persuades Noah's wife to give her husband a stupefying drink while he is building the ark, but an angel appears, and by his help the devil is confounded and the "ship well made."

The proverbial quarrelsomeness of Noah and his wife is illustrated in Chaucer's "Canterbury Tales," when Nicholas examines the carpenter on his knowledge of Noah's flood:—

Hast thou not herd, quod Nicholas also,
The sorwe of Noe with his felawship,
Or that he mighte get his wife to ship?
Him had be lever, I dare wel undertake,
At thilke time, than all his wether's blake,
That she had had a ship hireself alone.

In the presentment of *Abraham's Sacrifice*, the scene upon Mount Moriah loses none of its dignity and pathos at the hands of the dramatist. An exceptional feature of the Chester pageant is its opening with a comic prologue by one "Gobbel on the Green," but in the dialogue between the father and the doomed son the language is not less touching than that of either the Towneley, York, or Coventry, which last-named is much inferior to the rest.

In the Towneley, after dismissing two boys and an ass which had accompanied them "forth of towne," Abraham reaches the mountain:—

Lo, my son, here is the place.
Isaac. Wod and fyere ar in my hend;
Telle me now, if ye have space,
Where is the beest that shuld be brend (burnt).
Abraham. Now, son, I may no longer layn (conceal),
Sich wille is into myne hart went;
Thou was ever to me fulle bayn (ready)
Ever to fulfille myne entent.
Bot certanly thou must be slayn,
And it may be as I have ment.
Isaac. I am hevy and nothyng fayn (without joy)
Thus hastely that shalle be shent (destroyed).
A. Isaac!
I. Sir?
A. Com heder, bid I;
Thou shalle be dede what so ever betide.
I. A, fader, mercy! mercy!
A. That, I say, may not be denyde;
Take thi dede therefor mekely.
I. A, good sir, abide;
Fa ler!
A. What, son?
I. To do youre wille I am redy,
Where so ever ye go or ride,
If I may oght overtake youre wille,
Syn I have trespast I wold be bet.
* * * * * *
When I am dede, and closed in clay,
Who shalle then be youre son?
A. A, Lord, that I shuld abide this day.
I. Sir, who shalle do that I was won (wont)?
A. Speke no siche wordes, son, I the pray.
I. Shalle ye me slo?
A. I trow I mon;
Lyg stille, I smyte.
I. Sir, let me say.

* *Towneley Mysteries*, pp. 28, 29, 31. † York M.P., p. 47.

* That some artistic *mise en scène* was attempted is shown in the following stage directions:—"Then Noy shall goe into the Arke with all his famylye, his wife excepte: the Arke must be borded rounde about, and on the bordes all the beastes and fowles here after rehearsed must be painted, that these wordes may agree with the pictures."

A. Now, my dere child, thou may not shon.
I. The shynyng of youre bright blayde
It gars me quake for ferd to dee.
A. Therefor groflynges * thou shalle be layde,
Then when I stryke thou shalle not se.
I. What have I done, fader, what have I saide?
A. Truly, no kyns ille to me.
I. And thus gyltles shalle be arayde.
A. Now, good son, let siche wordes be.
I. I luf you ay.
A. So do I thee.
I. Fader!
A. What, son?
I. Let now be seyn
For my moder luf.
A. Let be, let be!
It wille not help that thou wold meyn (complain);
Bot ly stylle tille I com to the,
I mys a lytylle thyng I weyn.

Then making pretence of having lost something as excuse for delay, and to hide his tears, Abraham says:—

He spekes so rufully to me
That water shotes in both myn eeyn.
I were lever than all warldly wyn
That I had for hym onys unkynde;
But no defawt I faund hym in;
I wold be dede for hym or pynde,
To slo hym thus I thynk grete syn,
What shal I to hys moder say?
For wher is he tyte wille she spyr.

In modern English: What water shoots into both mine eyes! I should have been more glad than of all worldly gain, if I had found him once unkind; but I never found him in fault. I would willingly die or endure suffering for him: to slay him thus I think a great sin. What can I tell his mother when she quickly asks, where is he? Then the angel, with the "beest God sendes to thyn offerand," arrests the father's hand, but Abraham will not talk with him till he has unbound and kissed his son.

The corresponding scene in the York pageant is thus pourtrayed. When Isaac bids his father take the sword, since his "flesshe waxis faynte for ferde," Abraham replies:—

Nay, nay, sone, nay, I the be-hete,
That do I noght, with-outen were,
Thy wordis makis me my wangges (cheeks) to wete,
And chaunges, childe, ful often my cheere.
Ther-fore lye downe, hande and feete,
Nowe may thou witte thyn oure is nere.
Isaac. A! dere fadir, lyff is full swete,
The drede of dede dose all my dere.
As I am here youre sone,
To god I take me till,
Nowe am I laide here bone, (ready)
Do with me what ye will.
For fadir, I aske no more respete,
Bot here a worde what I wolde mene,
I beseke you or that ye smyte,
Lay doune this kyrcheffe on myn eghne.
Than may youre offerand be parfite,
If ye wille wirke thus as I wene,
And here to god my saule I wite,
And all my body to brenne bydene (burn forthwith).
Now fadir be noght myssyng,
But smyte fast as ye may.
Abraham. Fare-wele, in goddis dere blissyng,
And myn, for euer and ay.
That pereles prince I praye
Myn offerand here till haue it,
My sacryfice this day,
I praye the Lorde ressayue it.
Angel. Abraham! Abraham!
Abraham. Lo! here I wys.
Angel. Abraham, abyde, and halde the stille.
Sla noght thy sone, do hym no mysse,
Take here a schepe thy offerand tyll, [*a sheep comes in*]
Is sente the fro the Kyng of blisse.*

* With the face downwards.

To this pageant there succeeds in varying arrangement the *Processus Prophetarum*, in which Moses recites the commandments, while David, Daniel, the Sybil, &c., deliver the Messianic prophecies; the Towneley series containing an additional play on the like subject, entitled *Cæsar Augustus*. The *Pharao* of the Towneley series, and the *Departure of Israelites* in the York series, are nearly identical, and deal with the ten plagues, the deliverance of the Hebrews, and the drowning of the Egyptian pursuers, the last words of Pharaoh being—

Heyf up youre hertes unto Mahowne,
He wille be nere us in oure nede;
Help, the ragged dwylle, we drowne,
Now mon we dy for alle oure dede.

This pageant is absent both from the Coventry and Chester series, the plays based on the Old Testament in the former ending with *The Prophets*, and in the latter with *De Mose et Rege Balaak et Balaam*.

Of the York plays, 11 out of 48; of the Towneley, 8 out of 32; of the Coventry, 7 out of 42; of the Chester, 5 out of 25; are drawn from Old Testament narratives. That the five pageants occupied the first day's exhibition at Chester is shown by the closing lines of the play on Balaam:—

Nowe, worthy sires, bouth greate and small,
You have we shewed this stage before;
And yf yt be pleasinge to you all,
To morrowe nexte you shall have more.

* York Mystery Plays, pp. 64, 65.

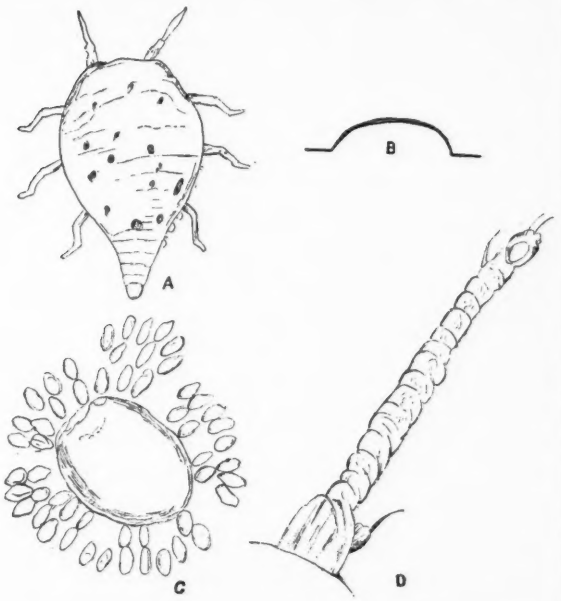
PLEASANT HOURS WITH THE MICROSCOPE.

By Henry J. Slack, F.G.S., F.R.M.S.

In the second week in August it was noticed that many oak leaves in a clipped hedge were full of yellowish-green spots. The cause of the appearance was seen immediately on looking at their under surface, where a number of minute, yellow, soft-looking objects were discovered. A hand-magnifier showed that they were very small insects in company with eggs arranged in concentric and nearly circular curves. Some of the creatures were completely surrounded with their eggs, which had the aspect of slender ovals of clear glass; others had only deposited a few eggs, and some of these were brought to the house without disturbing their position on the leaf, and placed under the microscope, with a 1½ inch power for a general view, and subsequently 1 inch, and ½ inch, and ⅙ inch, for observation of mere details. The first appearance of one of the egg-layers was that of a shapeless little mass of yellow jelly, destitute of limbs, and variegated with a few red spots. This state of things lasted for more than an hour, when some jerkish movements began. The antennæ, which had been folded close up to the creature, made some feeble motions, and some legs were protruded. It was, however, at the tail-end that most energy was displayed, and after a little while the Phylloxera, for such it was, assumed an appearance like Fig. A. The tail-end was employed as a feeler to ascertain the position of the last egg that had been laid. This information determined the creature's selection of the spot on which to deposit her next egg, which was guided to its place by a pair of blunt, pear-shaped ovipositors.

More eggs were laid in slow succession, and then came

a long pause, during which the performer changed her shape several times. In the A condition, the curves of her body were approximately circular, and regular from side to side. At one time a flat margin was seen all round, and a bump in the middle. B shows this form in section, and it is something like the figure given by Mr. Buckton in his valuable work. Fig. C represents the appearance of a quiescent female surrounded by more than fifty eggs. A finally got back into this lumpish shape.



In a day or two the egg-layers became scarce, and then vanished altogether, but scores of larvæ and pupæ continued their depredations on the hedge. Many oak-leaves were spotted all over with orange-red instead of the fresh greeny yellow first noticed. These exhibited no egg-layers, and the change of tint was the result of more complete destruction of the chlorophyl and cell tissue. A winged form was common on these leaves.

The writer has oak in various hedges made on the Sussex plan, but only one hedge was conspicuously attacked by the Phylloxera, and the large oaks, so far as could be seen, were not affected. The eggs, when first laid, were smooth and glossy, but after a little while they become pitted. None hatched while under several hours' observation, and when, a few days later, more specimens were wanted, none could be found. Buckton gives the size of the Queen Mother as 0·030 × 0·012, and describes her as very small and flask-shaped, which corresponds with A turned upside down. This form, however, was only exhibited in my specimens when the egg-laying was in process.

The antennæ are three-jointed. Fig. D shows two joints, the terminal one having a curious oval depression near the top, bounded by a raised wall. This does not exactly correspond with the description in Mr. Buckton's book, which, in describing the genus Phylloxera, says: "Antennæ three-jointed . . . The third joint much the longest, roughly imbricated, with a circular tubercle near its base, and a longer, somewhat inconspicuous, tubercle, towards its apex." The specimens I found had little projective "tubercles," from which a hair sprang, at the base, but the upper oval was certainly a walled depression, and appeared so with half-inch, sixth, and one-twelfth objectives. Two minute projections carry the hairs at the tip. The legs are short, with two claws and minute pulvilli. The visibility of the oval wall and depression depends upon its position under the microscope. A full-faced view is plain enough; a profile one at best looks like a very slight notch.

These Phylloxeræ are, according to Buckton, "in a qualified sense, exclusively oviparous, for the true ovum applies only in strictness to the produce of the perfect sexes." The pseudo-eggs laid here in August are thus to be regarded as only more backward stages of the least advanced young excluded by the aphides with their limbs still folded up.

The ringed forms, now on the oak leaves, are imagoes—the Latin plural looks awkward, and the word may, I hope, be treated as English.

"Late in the autumn," says Mr. Buckton, "the second brood of a late (winged) female occur, and these contain eggs of different sizes, disclosing the true males and their females." The Queen, or founder of a new brood, "is the produce of the single egg laid by the true female." The various forms are depicted in Mr. Buckton's work. I do not know whether my specimens belong to the species *punctata*, as they do not exactly correspond with his figures.

It is satisfactory that hitherto the English representatives of the genus Phylloxera have not been guilty of any serious injury like their relatives on the continent, which played such havoc in the vineyards. Speckling some leaves of our oaks is very different from the underground assaults on the vine-roots, against which no complete defence has yet been found. The mouth of Phylloxera is like that of the aphis.

The possessor of a microscope, unless very busy with some special study, should always be on the look-out as an observer of what is going on in minute life. Something fresh and interesting is sure to be the reward. For example, a glance at a mushroom-bed made in a frame and kept dark with a cover, showed some small odd-looking brown bodies moving clumsily about as soon as the light was allowed to enter. They proved to be small green flies (dipters)—whose name I do not know—and they were so thickly covered with mites that they could scarcely waddle, and not a bit of their skin could be seen. Two sorts of mites were visible with a handglass—one a Gamasid, like those common on bees and beetles, brown, with hard skins, and about as big as the heads of minikin pins. These were in clusters of half-dozen or more, and, beside them, were swarms of a smaller transparent and very lively mite. These last had their foremost legs longer and finer than the others, which is not uncommon. Watching their movements under an inch and a-half power sufficed to show that the motion of their legs differed somewhat from that of the others. They acted as pioneers, and rapidly changed the direction of motion, when, as often happened, they touched the legs of fellow-travellers. The antennæ being short, these legs did some of their work, as well as that of locomotion.

For permanent preservation, the Phylloxera and mites were mounted in balsam. A small ring of stout paper was gummed on to a glass-slide, and a minute quantity of Canada balsam put in the middle. To this the insects were cautiously transferred, and more balsam added to fill up the shallow cavity, and a cover-glass put on. This treatment sufficed for a small bit of oak-leaf with the Queen Mother and her eggs, as shown

XUM

in A. For quick treatment of dissected parts, such as antennæ or mouth-organs, a drop of saturated solution of potassic acetate answers, with a cover kept in its place by a ring of gummed paper.

FINDING THE WAY AT SEA.

By Richard A. Proctor.

(*Continued from p.* 150.)

UNFORTUNATELY, the longitude is not determined so readily. The very circumstance which makes the determination of the latitude so simple introduces the great difficulty which exists in finding the longitude. I have said that all places in the same latitude have the same celestial scenery; and precisely for this reason it is difficult to distinguish one such place from another, that is, to find on what part of its particular latitude-circle any place may lie.

If we consider, however, how longitude is measured, and what it really means, we shall readily see where a solution of the difficulty is to be sought. The latitude of a station means how far towards either pole the station is; its longitude means how far *round*, from some fixed longitude, the station is. But it is by turning round on her axis that the earth causes the changes which we call day and night; and therefore these must happen at different times in places at different distances round. For example, it is clear that if it is noon at one station it must be midnight at a station half-way round from the former. And if any one at one station could telegraph to a person at another, "It is exactly noon here," while this latter person knew from his clock or watch, that it was exactly midnight where *he* was, then he would know that he was half-way round exactly. He would, in fact, know his longitude from the other station. And so with smaller differences. The earth turns we know from west to east,—that is, a place lying due west of another is so carried as presently to occupy the place which its easterly neighbour had before occupied, while this last place has gone farther east yet. Let us suppose an hour is the time required to carry a westerly station to the position which had been occupied by a station to the east of it. Then manifestly every celestial phenomenon depending on the earth's turning will occur an hour later at the westerly station. Sunrise and sunset are phenomena of this kind. If I telegraph to a friend at some station far to the west, but in the same latitude, "The sun is rising here," and he finds that he has to wait exactly an hour before the sun rises there, then he knows that he is one hour west of me in longitude, a most inexact yet very convenient and unmistakable way of speaking. As there are twenty-four hours in the day, while a complete circle running through my station and his (and everywhere in the same latitude) is supposed to be divided into 360 degs., he is 15 degs. (a 24th part of 360) west of me; and if my station is Greenwich, he is in what we, in England, call 15 degs. west longitude.*

But what is true of sunrise and sunset in the same latitudes and in different longitudes, is true of noon whatever the latitude may be. And, of course, it is true of the southing of any known star. Only, unfortunately, one cannot tell the exact instant when either the sun or a star is due south or at its highest above the horizon. Still, speaking generally, and for the moment limiting our attention to noon, every station towards the west has noon later, while every station towards the east has noon earlier, than Greenwich (or whatever reference-station is employed).

I shall presently return to the question how the longitude is to be determined with sufficient exactness for safety in sea voyages. But I may digress here to note what happens in sea voyages where the longitude changes largely. If a voyage is made towards the west, as from England to America, it is manifest that a watch set to Greenwich time will be in advance of the local time as the ship proceeds westwards, and will be more and more in advance the farther the ship travels in that direction. For instance, suppose a watch shows Greenwich time; then when it is noon at Greenwich the watch will point to twelve, but it will be an hour before noon at a place 15° west of Greenwich, two hours before noon at a place 30° west, and so on—that is, the watch will point to twelve when it is only eleven o'clock, ten o'clock, and so on, of local time. On arrival at New York, the traveller would find that his watch was nearly five hours fast. Of course, the reverse happens in a voyage towards the east. For instance, a watch set to New York time would be found to be nearly five hours slow, for Greenwich time, when the traveller arrived in England.

In the following passage these effects are humorously illustrated by Mark Twain:—

"Young Mr. Blucher, who is from the Far West, and on his first voyage" (from New York to Europe) "was a good deal worried by the constantly changing 'ship-time.' He was proud of his new watch at first, and used to drag it out promptly when eight bells struck at noon, but he came to look after a while as if he were losing confidence in it. Seven days out from New York he came on deck, and said with great decision, 'This thing's a swindle!' 'What's a swindle?' 'Why, this watch. I bought her out in Illinois—gave 150 dols. for her, and I thought she was good. And, by George, she *is* good on shore, but somehow she don't keep up her lick here on the water—gets sea-sick, maybe. She skips; she runs along regular enough till half-past eleven, and then all of a sudden she lets down. I've set that old regulator up faster and faster, till I've shoved it clean round, but it don't do any good; she just distances every watch in the ship,* and clatters along in a way that's astonishing till it's noon, but them "eight bells" always gets in about ten minutes ahead of her any way. I don't know what to do with her now. She's doing all she can,—she's going her best gait, but it won't save her. Now, don't you know there ain't a watch in the ship that's making better time than she is; but what does it signify? When you hear them "eight bells," you'll find her just ten minutes short of her score—sure.' The ship was gaining a full hour every three days, and this fellow was trying to make his watch go fast enough to keep up to her. But, as he had said, he had pushed the regulator up as far as it would go, and the watch was 'on its best gait,' and so nothing was left him but to fold his hands and see the ship beat the race. We sent him to the captain, and he explained to him the mystery of 'ship

* In this case, he is "at sea" (which, I trust, will not be the case with the reader), and, we may suppose, connected with Greenwich by a submarine telegraph in course of being laid. In fact, the position of the *Great Eastern*, throughout her cable-laying journeys, was determined by a method analogous to that sketched above.

* Because *set* to go "fast." Of course, the other watches on board would be left to go at their usual rate, and simply put forward at noon each day by so many minutes as corresponded to the run eastwards since the preceding noon.

time' and set his troubled mind at rest." "This young man," proceeds Mr. Clemens, *apropos des bottes*, "had asked a great many questions about sea-sickness before we left, and wanted to know what its characteristics were, and how he was to tell when he had it. He found out."

I cannot leave Mark Twain's narrative, however, without gently criticising a passage in which he has allowed his imagination to invent effects of longitude which assuredly were never perceived in any voyage since the ship *Argo* set out after the Golden Fleece. "We had the phenomenon of a full moon," he says, "located just in the same spot in the heavens, at the same hour every night. The reason of this singular conduct on the part of the moon did not occur to us at first, but it did afterwards, when we reflected that we were gaining about twenty minutes every day, because we were going east so fast; we gained just about enough every day to keep along with the moon. It was becoming an old moon to the friends we had left behind us, but to us Joshuas it stood still in the same place, and remained always the same." Oh, Mr. Clemens, Mr. Clemens! In a work of imagination (as the "Innocents Abroad" must, I suppose, be to a great extent considered), a mistake such as that here made is perhaps not a very serious matter; but suppose some unfortunate compiler of astronomical works should happen to remember this passage, and to state (as a compiler would be tolerably sure to do, unless he had a mathematical friend at his elbow), that by voyaging eastwards at such and such a rate, a traveller can always have the moon "full" at night, in what an unpleasant predicament would the mistake have placed him. Such things happen, unfortunately; nay, I have even seen a work, in which precisely such mistakes have been made, in use positively as a text-book for examinations. On this account, our fiction writers must be careful in introducing science details, lest peradventure science teachers (save the mark!) be led astray.

It need scarcely be said that no amount of eastwardly voyaging would cause the moon to remain always "full" as seen by the voyager. The moon's phase is the same from whatever part of the earth she may be seen, and she will become "new," that is, pass between the earth and the sun, no matter what voyages may be undertaken by the inhabitants of the earth. Mr. Clemens has confounded the monthly motion of the moon with her daily motion. A traveller who could only go fast enough eastwards might keep the moon always due south. To do this he would have to travel completely round the earth in a day and (roughly) about 50½ minutes. If he continued this for a whole month, the moon would never leave the southern heavens; but she would not continue "full." In fact we see that the hour of the day (local time) would be continually changing,—since the traveller would not go round once in twenty-four hours (which would be following the sun, and would cause the hour of the day to remain always the same) but in twenty-four hours and the best part of another hour; so that the day would seem to pass on, though very slowly, lasting a lunar month instead of a common day.

(To be continued.)

Liabilities of Telephone Companies.—According to exchanges, the telephone companies in the States may be held liable for injuries to passengers by the fall of their wires in the public street. In a recent case, in which this was decided, the wires gave way in consequence of the weight of the ice produced by water thrown upon them by a city fire department whilst extinguishing a fire.

RAMBLES WITH A HAMMER.

By W. Jerome Harrison, F.G.S.

THE ROCKS OF THE LICKEY.

(Continued from page 135.)

RETRACING our steps to the Lickey ridge—and here the New Rose and Crown offers the only chance of refreshment for some distance round—we continue our south-easterly walk over the camel-backed hills which succeed one another in that direction. To the east the Triassic sandstones and clays form a plain extending to Birmingham, while on the west lies a narrow valley above which rises the Bromsgrove Lickey, a parallel chain of hills to that upon which we are walking, but of much greater altitude—the highest point of the "Lower Lickey" (upon which we are now, in imagination, standing) being about 500 feet above sea-level, while the height of the "Bromsgrove Lickey" is about 900 feet. At one spot on the road where a little lane branches off to the right, another patch of the breccia at the base of the Llandovery sandstone is seen, showing that this rock once extended right over the hills, although it has now been almost entirely denuded off them. The quartzite supports but a scanty vegetation, conspicuous amongst which are the bilberry bushes, which in the autumn furnish an abundant harvest of blue berries to many busy gatherers. Rabbits flit among the ferns, watched by a kite which hovers overhead, and the whole scene causes us to envy the occupiers of the trim villas which are springing up here and there round the Lickey, but to hope that the ridge itself—too steep and bare for cultivation—will long be preserved as a free and "happy hunting-ground" for the lover of nature.

Turning to the left, when we arrive at a steep, almost precipitous descent, we once more reach the main road, at the eastern foot of the hills at Rednal. Continuing southwards, we note a quarry in which the quartzite is grandly bent and contorted, showing that we are here close to the line of fault which runs along this edge of the ridge. A mile more and we reach Kendal End, where a divergence to the right, past the farm-house, should be made to examine a patch of *Wenlock limestone*, which must owe its position here to a system of faults. It lies in an old quarry, now planted over with trees [see Map (3), *ante*, p. 134]. The high road now must be regained, and in ten minutes we reach Barnt Green House, close to the railway-bridge, the residence of Mr. Thompson, agent to Lord Windsor, who owns much land about here. We have to thank this gentleman for the permission—which would doubtless be accorded to any respectable visitor—to examine the interesting rocks exposed along the brook-course which traverses the grounds [see Map (4)]. In many districts the sections of the strata exposed by running streams afford the only plain indications of the succession of the rocks, and in a new district it is always well to first walk up the available brooks and rivers. Pursuing this plan, we find forming the bed and banks of the purling brook a singular dark-grey rock, which readily breaks into rhomboidal blocks, being traversed by many joints. Sometimes this rock is of a red or yellowish colour, and it is frequently more or less spotted. It has an earthy look, and altogether reminds one of a compacted volcanic ash, such as forms many square miles of the country round Vesuvius. But if active volcanoes once existed in this corner of Worcestershire, and erupted the mass of ashes which now, hardened into solid rock, lies beneath

our feet, it must have been at a very early geological period, for these old volcanic ashes can be proved to *underlie*, and therefore to be older than, all the other rocks here visible. The quartzite, we know, is of great antiquity, but these rocks at Barnt Green must be still older, for they underlie the quartzite. Now, at Nuneaton and at the Wrekin, volcanic rocks are also found beneath the quartzite. Moreover, in Wales, in Charnwood Forest, and elsewhere, a great mass of bedded volcanic rocks—ashes, lavas, &c.—are found to underlie the Cambrian strata, and are assigned to a Pre-Cambrian period, which includes the oldest stratified rocks of which we have any knowledge.

Thus it seems that, peeping out in this little corner of the Lickey at Barnt Green, we have a representative of the earliest-formed series of rocks known upon the globe—the great Pre-Cambrian Formation—which are everywhere unfossiliferous. Above them, and constituting the ridge called the Lower Lickey, comes the Cambrian quartzite, whose thickness is probably between 300 and 400 feet. Resting unconformably on the quartzite are Upper Silurian strata; above them come the coal-measures, which form the extreme southerly termination of the South Staffordshire coal-field; next we get Permian rocks, crowded with fragments of the older beds beneath; and, above all, the Trias, or New Red Sandstone, in whose Bunter pebble-bed we see a great conglomerate of quartzite pebbles, many of which were undoubtedly derived from the ridge of the Lickey, or its extension.

For although this quartzite of the Lickey is now only exposed as a tiny range of hills, yet in carboniferous times it formed part of a land-barrier which extended across central England from the hills of Charnwood to the Malverns. Of this old land, the Hartshill range, Dosthill, the Lickey, the Silurian bosses at Dudley Castle and the Wren's Nest, the Wrekin range, and the Longmynd hills of Shropshire, are isolated fragments which owe their present position to the combined action of the volcanic forces by which they have been upheaved, and the forces of denudation by which they have been laid bare. But various deep borings—more especially those in Leicestershire, and between Leicester and London—have revealed the presence of a continuation of these old rocks beneath the surface at no great depth, and they form the floor of all the country between the Thames Valley on the south, and a curved line joining the Malvern with the Charnwood hills on the north.

It is an interesting task to search in the newer strata—the Permians and the Trias—for the relics of this old land, which reared its head proudly above the waters in which they were deposited. In Bangham-lane, leading to Northfield, two or three miles north of the Lickey, there is a section of Permian breccias from which quite a suite of Silurian fossils may be collected, showing that Silurian rocks formed the margin of the sea in which the Permian strata were laid down.

If the geologist can devote a whole day to the examination of the Lickey, he may, instead of returning from Barnt Green station, walk along the *western* side of the Lickey ridge back towards Rubery. At the northern end of the ridge several fine boulders are to be seen lying on the roadside or in the waste corners of fields. These boulders are mostly blocks of rock which have been transported from North Wales by ice during the last Glacial Period. Such blocks lie thickly, too, over the country round Northfield, where the "Great Stone Inn" takes its name from the mass of Welsh felstone which now rests near its door.

FINAL OPERATIONS FOR THE REMOVAL OF FLOOD ROCK.

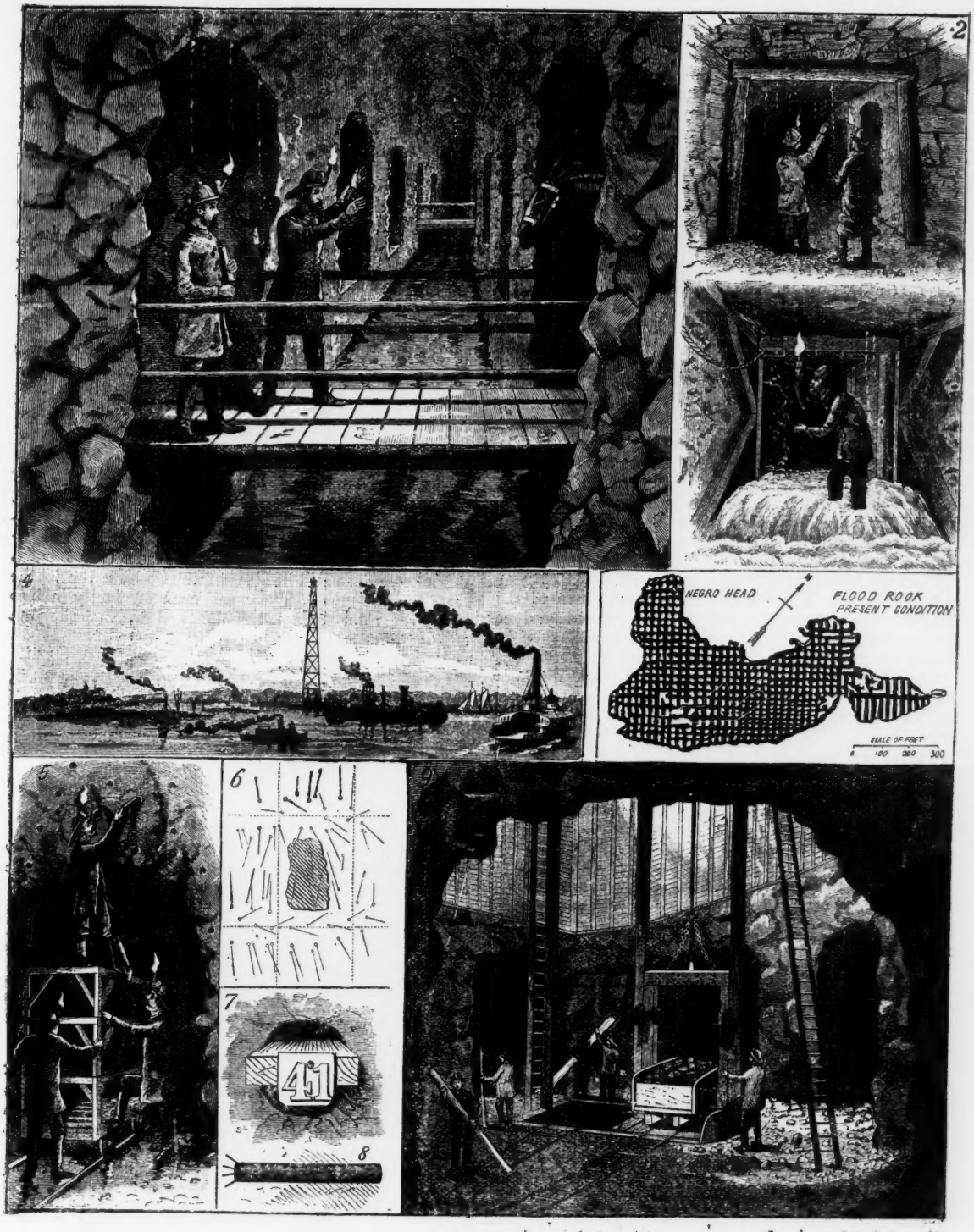
FLOOD Rock, a ledge of gneiss situated about one-quarter of a mile from Hallet's Point, Astoria, L.I., is one of the most formidable of the many obstructions by which all the commerce passing through Hell Gate has been menaced. This rock forms a very irregular obtuse cone, only a small portion of the apex of which comes above water. This formation and its location in the bend of the river almost in the centre of a swift current at each change of the tide make it an object of great dread to pilots. The work of removing this rock was begun in 1875, and after unnecessary and costly delays caused by the failure of Congress to appropriate sufficient money from year to year the entire excavation has been completed, all the drill-holes have been bored, and all that remains to be done is the charging of the holes with explosives, removing the plant, and dredging the broken rock after the firing. The total cost of the improvement will be about 1,000,000 dols.

The method pursued may be briefly described, the familiarity of our readers with the undertaking rendering a detailed account uncalled for. A shaft was sunk at the highest point of the rock to a depth of sixty feet below water level, and from this shaft galleries were extended parallel with and at right angles to the current. These galleries are twenty-five feet between centres, and extend under all the rock to be removed. It was not the design to remove the rock as much as possible by means of these tunnels—owing to the fact that it would be cheaper to dredge the broken rock after the explosion—which were only expected to serve as passageways honeycombing the rock and through which access could be had to all parts in order to place the powder. Absolute regularity in the spacing of the galleries could not be maintained owing to inequality in the texture and formation of the rock. The plan view in the accompanying illustrations shows the present condition of the excavation, and, being drawn to scale, it presents a good idea of the magnitude of the work.

Thus was formed an immense chamber, averaging about 10 ft. from floor to ceiling, having a stone roof averaging about 15 ft. in thickness, and supported by 467 rugged and massive columns. In this chamber, running parallel with the East River, are twenty-four galleries, the longest measuring 1,200 ft., and running at right angles to the stream are forty-six galleries, the longest of which is 625 ft. The area covered by the chamber is about nine acres. The aggregate length of the galleries is 21,670 ft.

The mining operations were not attended with unusual risk either to the men or the work; the main danger was from the flooding of the mine through the opening of a fissure, or the meeting with a rock "keyed the wrong way," which would admit the water in quantities too great to be handled by the pumps. Fissures were frequently encountered, but fortunately none of excessive size; the large holes were plugged with wood, loose filling, such as cement, being unavailable because of the great pressure of water, some 26 lb. to the square inch. To escape the drippings, and in some cases the pourings, from the roof, and to enable the visitor to walk dry-shod through the small brooks running down some of the galleries, he is, through the kindness of those in charge of the work, encased in rubber from head to foot.

The north-eastern portion of the excavation, having an area of about one acre, was through rock very irre-



gularly fissured, and as the roof approached closer to the bed of the river great care was exercised in driving the headings; in some places it was found expedient to support the roof and sides with heavy timbers, as shown in Fig. 2. In order that the caving in of any part of this section should not flood the main work a strong door (Fig. 3) was early built in the gallery connecting the two sections. Attached to the outer edges of this door is a rope, leading over a pulley in the casing and along the gallery to the shaft; the door can thus be easily and

quickly closed, should it become necessary at any time to shut off the weak portion of the work.

Thirteen thousand two hundred and eighty-six holes have been drilled in the columns and roof, the holes being 3 in. in diameter and having an average depth of 9 ft.; these holes, if placed end to end, would reach over 22 miles. During the progress of the work an accurate plan was kept, showing the location and number (Fig. 7) of each hole, together with its inclination and depth. Fig. 6 shows this hole plan for one column—the shaded portion—and the adjoining galleries, the centres of which are represented by the dotted lines. The holes in the columns are about 5 ft. apart, and extend upward at an angle of about 45 deg.; the holes in the roof are about 4 ft. apart, and are at an angle of 60 or 65 deg. No holes were drilled near the floor. Each hole will be filled partly with "rackarock" powder and partly with No. 1 dynamite. The form of the cartridge is shown in Fig. 8, the projecting wires shown at one end being intended to hold the cartridge in position in the hole. Fig. 5 shows the method of charging the holes. A small car is provided with several frames, made to fit on top of the car, and each being about the size of the car, the frames can be placed as needed, one on the top of the other, thus furnishing a platform from which the holes in the highest galleries can be reached. The track consists of two movable sections, about 15 ft. long. Should no delay occur, it is expected to complete the charging of the holes by October 1.

The next operation will be to remove all the machinery and buildings, and the top of the island down to the water's edge. Of course, much of this work can be done during the time of charging. The mine will then be flooded and the charge exploded by means of electricity.

The engraving, Fig. 1, shows the drainage ditch or deep gallery, extending across the mine a short distance north of the shaft. The longitudinal galleries cross this ditch, which at the point shown in the cut is some thirty-five feet from the floor to the roof, by wooden bridges. Extending around the southern part of the mine and along the eastern extremity is a second ditch, connecting with the first; a third ditch leads from the eastern side to the sump, just east of the main shaft (Fig. 9), where pumping-engines having a capacity of 4,000 gallons per minute are located. This plan of draining the mine by means of a ditch around the extremity was made necessary by the slope of the river bed; in order to leave sufficient rock in the roof, the galleries slope downward from the centre.

The work was planned and has been carried forward by General John Newton, Chief of Engineers, U.S.A. We are indebted to the courtesy of Lieut. G. McC. Derby, superintendent of the work, for the privilege of examining the mine, and for data.—*Scientific American.*

TRICYCLES IN 1885.

By John Browning.

(*Chairman of the London Tricycle Club.*)

A PERFECT SADDLE.

THE Tubular Buffer Tension Saddle, just brought out by Messrs. Lamplugh & Brown, completely eclipses all their former contrivances. The frame of the saddle is formed of two steel tubes, about a quarter of an inch in diameter; one straight, forming the backbone, the other curved, acting as the back of the saddle. The leather, which is stretched on these tubes, being divided, when the leather is on, the two sides are locked together by a strong hook underneath.

Whenever the tricycle has to be kept in a damp place, or left in the open air, the leather top can be removed in a single minute. Not only is a dry seat thus ensured, but it would be almost impossible for any one to ride away with the machine. For when the leather top is removed the curved tube on which the rubber-lined back of the saddle slips drops, being only held in position by the leather.

While being ridden the saddle is not a rocking saddle—that is, it is not free to turn on a hinge, but it is a *swaying* saddle, giving way a little on each side—from the back at each motion of the leg, and thus preventing the chafing which many riders suffer from so severely.

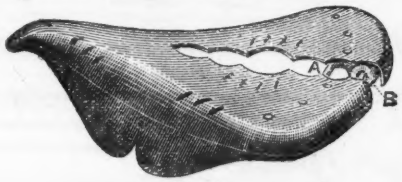


Fig. 1.

Fig. 1 is a top view of the saddle. A is the hook which clasps the two sides together underneath. It will be seen that there is such a space left between the two portions or sides of the leather that no injurious pressure can be exercised by this saddle. B is an end of one of the stout vulcanised rubber tubes to which the leather sides are attached. These act most efficiently in insulating the rider from concussion, and warrant the name of the Buffer Saddle.

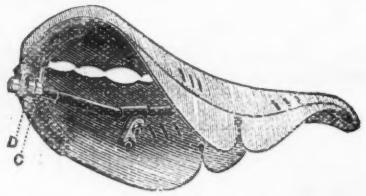


Fig. 2.

The under view of the saddle is shown in Fig. 2. In this, C and D represent a nut and a check-nut, which are used for increasing the tension when it is necessary.

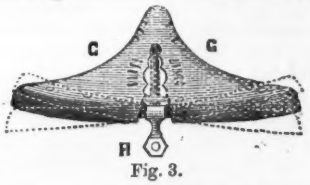


Fig. 3.

The swaying motion of the saddle is shown in Fig. 3. The peak of the saddle remains stationary, but the sides sway up and down on the pivot H by the action of the rider. I find this swaying motion such a luxury that I will never ride a fixed saddle again.

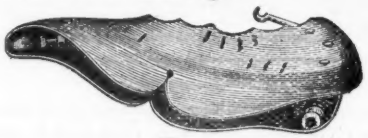


Fig. 4.

The leather top of the saddle unattached and folded is shown in Fig. 4.

The merits of this saddle are so conspicuous that I should say, while we are indebted to Starley for the tricycle, we owe the perfect saddle to Lamplugh & Brown, and I should like to see some testimonial given to them from devotees of the tricycle in acknowledgment of their ingenuity and enterprise; in which I should be glad to join.

The comfort and efficiency of a saddle depends to a considerable extent on its being set at exactly the right pitch to suit the rider. If it be too low in front the rider has a constant tendency to slip forward, and if in correcting this the front be raised too high it is not only uncomfortable, but an injurious pressure may be caused by the peak when riding.

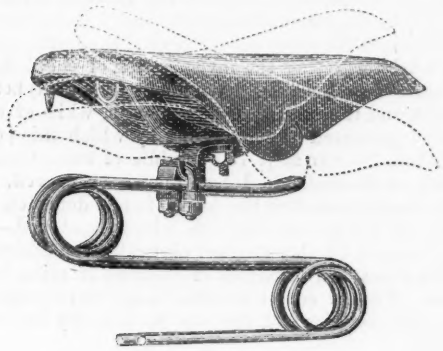


Fig. 5.

Starley's saddle-tilt, for which Lamplugh & Brown are the agents, is a contrivance which enables the rider to alter the pitch of the saddle in one or two minutes. Instead of clamping the saddle directly on to the spring in the usual manner, in which case its pitch has to be adjusted by wedges, a bar with a groove in it is clamped on to the spring, and a hollow piece which turns in it is attached to the saddle. The attachment to the saddle is placed so that it rests in the groove, and a holdfast clamp is placed astride of both, and clamped firmly down by means of two nuts clutching them together.

It is obvious that if it should be desired to change the pitch of the saddle, all that is necessary is to slacken the two nuts, rotate the saddle attachment under the stirrup, and tighten the nuts until the saddle is fixed in the new position.

The action will be seen from the engraving (Fig. 5), which shows the saddle in three positions.

When the various details of our machines have been worked out with the same thoughtful and minute attention which has been bestowed on the Buffer Saddle, we shall possess something like a perfect tricycle.

International Inventions Exhibition.—We notice that a silver medal, the highest award for geographical apparatus, has been obtained by Mr. W. Rice, of 86, Fleet-street. Mr. G. W. Bacon also receives a bronze medal for his cheap atlases.

In the Botanical Garden at Dijon there is a poplar of colossal dimensions—species not stated—to which Mr. Joly devotes a note in the *Journal de la Société Nationale d'Horticulture*. The height of this tree is 130 ft. Its circumference near the earth is 46 ft., and at 16 ft. above the earth 21 ft. Its bulk is now 1,590 cubic feet, but six years ago, before the fall of one of the largest branches, it was 1,940 ft. From some historic researches made by Dr. Lavelle, and a comparison with trees of the same species in the vicinity, it has been pretty well ascertained that this poplar is at least 500 years old. Unfortunately, it is now completely hollow up to the point whence the large branches spring. All the dead portions have been removed, and the interior has been filled in with beton.

THE FACE OF THE SKY.

From August 28 to September 11.

By "F.R.A.S."

THE student will, as usual, watch the Sun on every clear day for spots and faculæ. The stars visible at night are shown in Map IX. of "The Stars in their Seasons." Minima of Algol will occur on Sept. 7, at 1h. 17m. a.m.; and on Sept. 9 at 10h. 6m. p.m. Mercury comes into inferior conjunction with the Sun at 6 p.m. on Sept. 2. He will scarcely be fairly observable until the second week in September. He travels through Leo during the next fourteen days. Venus is not a particularly interesting object, with her small gibbous disc. She is in Virgo. She may, possibly, be picked up with the naked eye, after sunset, over the western horizon. Mars, Jupiter, Uranus, and Neptune are all invisible; but Saturn is coming into view again as a morning star. He rises before midnight to-night, and a fortnight hence just before 11 p.m. He forms a triangle with ϵ and γ Geminorum ("The Stars in their Seasons," Map. II.). The Moon enters her last quarter at 5h. 14·8m. in the early morning of Sept. 2, and is new at 8h. 43·2m. p.m. on the 8th. Six occultations occur, within convenient hours for observation, during the period covered by our notes—four of them on the night of Sept. 1. Imprimis before the Moon rises, θ^1 Tauri and θ^2 Tauri, two stars each of the 4½ magnitude, will have disappeared at the bright limb of the Moon. After she appears above the horizon, θ^1 Tauri will reappear at her dark limb at 10h. 51m., and θ^2 Tauri one minute later. The first star will reappear at an angle of 227° from the Moon's vertex, the second one 247° from the same point. Then at 11h. 1m. B.A.C. 1391, a 5th magnitude star, will disappear at the Moon's bright limb at an angle from her vertex of 117°, to reappear at her dark limb at 11h. 32m. p.m. at a vertical angle of 189°. Subsequently the 6th magnitude star, 85 Tauri, will disappear at the bright limb at 11h. 21m. at a vertical angle of 20°; reappearing 1m. after midnight at the dark limb, at an angle of 284° from the vertex of the Moon. The Moon will pass very close to Aldebaran at 1h. 40m. the next morning. On September 2 117 Tauri, a star of the sixth magnitude, will have been occulted below the horizon, but may be seen to reappear after the Moon has risen at her dark limb at 11h. 20m. p.m. 221° from her vertex. Finally, on the same night, B.A.C. 1728, another 6th magnitude star, will disappear at the bright limb of the Moon 13 minutes after midnight, at an angle of 9° from the Moon's vertex, and will reappear at her dark limb at 12h. 48m. p.m., at a vertical angle of 288°. The Moon is in Pisces all day to-day and to-morrow, but at 4 a.m. on Aug. 30 crosses into the north-west corner of Cetus. It takes her until 3 p.m. on the 30th to travel through this, and she then enters Aries. She quits Aries for Taurus at 8 p.m. on the 31st, and she proceeds on her passage through the last-named constellation until 9 a.m. on Sept. 3, when she arrives at the narrow northernmost strip of Orion. Leaving this at 8 o'clock the same evening, she emerges in Gemini, across which she is travelling until 10h. a.m. on the 5th. At the hour last named she crosses into Cancer, where she remains until 9h. 30m. p.m. on the 6th. From Cancer she passes into Leo. In her passage through Leo she descends, at 7 a.m. on the 8th, into Sextans, but three hours later emerges once again in the first-named constellation. She finally quits Leo for Virgo at 8 a.m. on the 9th, and is passing through this great constellation when our notes terminate.

Thomas Boyd, the first white man to cross the Murray River, and the last survivor of the Hume and Hovele exploring party, has died recently in Sydney, at the age of eighty-eight years, and, as we regret to learn, in great poverty.—*Athenæum.*

Another Alpine town will shortly be lighted by electricity, and following the example of Aosta, the municipality of Vazallo have recently decided to illuminate the town by electricity. The system to be adopted will be that of Cruto, and the streets will be lighted with 70 incandescent lamps. The current will be furnished by two dynamos driven by a turbine, as abundant water-power is at hand in the torrent Sesia. Besides the public lamps, the dynamos will supply from 90 to 100 lamps in private houses.

The Lighthouse Experiments.—The result of the recent experiments at the South Foreland lighthouses, in which the relative merits of oil, gas, and electricity were tested, is, in the view of the committee which carried out the investigations, to establish the fact that "for the ordinary necessities of lighthouse illumination oil is the most suitable and economical illuminant, and that for salient headlands, important land-falls, and places where a very powerful light is required, electricity offers the greatest advantages." The objection to the electric light for ordinary lighthouse purposes is that, although better than oil or gas in foggy or misty weather, it is too dazzling in fine weather.

XUM

Gossip.

By Richard A. Proctor.

Referring to part of "Hallyards'" letter on "Magnification near the Horizon," I may remark that whether the mind does or does not unconsciously assign to the sky the form of a flattened dome is a question which cannot be disposed of quite so simply as "Hallyards" imagines. The question how much farther away the horizon seems to be than the point overhead, the sky being clear, was put by Delambre, as one depending on precise laws of optics—and the answer was "The horizon seems between three and four times as far away as the zenith." The idea of actual magnification, as an explanation, is absurd on the face of it; for if in a particular state of the air the horizontal moon, really subtending—say—30′ when not magnified, were made to subtend—say—45′, it would follow that if there were 720 horizontal moons so placed that if not magnified they would just make the circuit of the horizon, then either, as actually seen through that peculiar air they would overlap (which of course is absurd) or they would more than go round,—once and a-half round in fact—which is preposterous. (Of course it is as easy to say that the dew or fog or rain may magnify as it is to say that a body's velocity may prevent it from yielding to the attraction of gravity, or that under particular circumstances two and two might make seventeen and a-half.)

"Hallyards" may not be aware that the constellations seem to look larger near the horizon—but they cannot really look larger, or they would not all get in. The fact really is that an object can only seem to look larger than usual, when not really magnified, through some illusion which makes us imagine that the object is unusually distant.

Mr. Brothers has called my attention to an illusion which is easily tested in illustration of this. Look at some dark object on a light ground, and presently look at a white surface at the same distance: you then see the object light (and in complementary colour) and unchanged in size. But if now you look at a distant light surface, the image of the object seems to grow suddenly larger. In reality it does not increase at all in apparent size, but subtends—as of course it should—precisely the same angle, being an unchanged retinal impression, unchanged at least in extent.

The apparent magnifying of the sun, the moon, star-groups, comets, &c., near the horizon is in reality the best proof we have that the mind unconsciously assigns (as Delambre thought he had proved it ought to assign) a much greater distance to the horizon than to the zenith. That this effect varies in degree with varying states of the air shows that the mind unconsciously varies its estimate of the horizon's distance according to the state of the air. This may seem to some like arguing in a circle. But you can argue safely in a circle when you have facts all round. The fact that the moon seems to look larger near the horizon, nay much larger (insomuch that my small-disc method of measuring is by no means rough for such a problem), while in the first place we know from measurement that she does not subtend a larger angle, and in the second place from the laws of optics that she cannot be really magnified, is a good fact to argue from. So is the fact that the horizon ought to be judged farther off, some 3½ times, than the zenith. If these facts correspond with each other that is only because, being facts, they naturally "behave as such."

My attention has been called by a correspondent who wishes to be referred to as "L. E." (I should have preferred thanking him by name) to a singular mistake in my last remarks respecting the Ruddy Eclipsed Moon. I could scarcely believe I had made such a strange mistake till I referred to my article: but there it is; and rightly understood it is a mistake well worth Miss Ballin's attention as a singular mental phenomenon.

I had explained, at p. 46, that the focus of a pencil of rays from the sun after deflection through our earth's atmosphere towards the moon lies far beyond the earth,—*not* (as many, misinterpreting the investigation of the deflection of the axes of such pencils, have fondly imagined) between the earth and the moon. Oddly enough, while of course my mind possessed the reasoning by which this point is established, I wrote at p. 135 (middle of second column) precisely as if—instead—I had known or proved, somewhere or somehow, that the focus of such deflected light-pencils lay far beyond the *sun*, which is absurd,—even taking along with this original absurdity the derived one that the focus lies hundreds of millions of miles beyond the sun. This of course was due to my setting the focus as far relatively beyond the *sun*, as it really lies beyond the earth.

Partly as a penalty for my carelessness, partly perhaps to prove that I am not ashamed to acknowledge and correct a mistake (venial vanity, I trust), and partly to show that I had correctly considered the matter originally at p. 46, I will now show how the position of the focus for a pencil of rays leaving the sun's face for the edge of the earth's disc (as seen from the moon) may be roughly determined. The exact problem would be one of some difficulty, but we can get a rough solution by the following device. The breadth of the sun during central eclipse is contracted, by the deflection of the axes of pencils, to about 2½ miles at the edge of the earth's disc as supposed to be seen from the moon. (This supposes the part of the sun's disc farthest from the rim of the earth just lifted into view by grazing refraction, and the part nearest the earth's rim lifted into view by atmospheric layers about 2½ miles above the sea-level.) Now this shows that the bounding pencil-axes have their convergence towards the eye of an imagined lunarian diminished to about 1-800th of what it had before been. For when the earth is away the sun's disc subtends at the moon about half a degree, corresponding to about 2,000 miles at the earth's distance, and 2,000 miles exceed 2½ miles 800 times. It follows (since the lines of sight through the earth's atmosphere to different points on the sun follow precisely the same course as rays from those points to the eye from which the lines of sight were taken) that the divergence of a pencil from a point of the sun to our earth's atmosphere, to reach the moon, is increased on the average about 800 times. (On the average, because we have dealt with the convergence after passing through the whole depth of 2½ miles: the eye-pupil can take in only a portion of each pencil, a small fraction of an inch broad where passing through the earth's atmosphere.) This being so, it follows that the foci of such pencils lie on the average at a distance beyond the earth (as seen from the moon) equal to about 1-800th of the sun's distance,—say

roughly, about 116,000 miles (less than I had expected to find this average). Being thus, on the average, about 355,000 miles from the moon, and on lines inclined nearly one degree to the direction of the earth's centre, it follows that these foci lie on the average about 60,000 miles from the line through the centres of the sun, earth, and moon, at the time of central eclipse.

I TRUST the readers of KNOWLEDGE will appreciate the liveliness of the last piece of Gossip. But it serves to illustrate the way in which a student of science, even when he begins to chat with the idea of treating his subject lightly, is apt to wander off into other than mere gossipy matters. Let it stand, then. Better so than as part of another article on the ruddy eclipsed moon. Let me thank L. E. again for correcting my remarkable mistake.

E. C. H. sends another letter on the "double have" question. Let me put definitely my own opinion. I do not defend such a phrase as "I should have liked to have seen him;" because they sound badly. But grammatically they are defensible. As I pointed out to "Hallyards"—who did not see it, of course—"I should have liked to see him," even in reply to the statement that "Mr. So-and-So called this morning," does not necessarily mean, "I should have liked to see him this morning when he called." It might be a convenient way of answering, in words, with a real meaning very unlike that which the words might be taken to bear—as for instance, "I should have liked to see him (in former times, but I am mightily glad to have escaped him this morning,") or "I should have liked to see him (if I did not know what an intolerable bore he is—or rogue—or as the case may chance to be.") Now there can be no doubt the second "have" definitely points to the time or occasion which had just been named.

THAT the objection to the "double haves" is merely one against their sound may be shown by sentences in which the "haves" are doubled but euphony retained. For example, "I am sorry I was not at home when A called: to have had a chat with my dear old friend, after so many years of separation, would have been a great pleasure." Or again, the double "haves" come in all right in the following answer, where the two forms of reply are distinguished:—"I am glad I was not at home: I should have liked to see him when I loved and trusted him, but to have seen him to-day, knowing him for what he is, would have been most painful to me."

"E. C. H." rightly remarks that Dr. Hodgson's detection of doubled "haves" in the writings of Macaulay, Ruskin, Landor, and other such masters, goes far to neutralise (he might have said utterly neutralises) the previous condemnation. Authors as a rule are much better judges in these matters than grammarians, sentence-analysers, *et id genus omne*. Dr. Hodgson sitting in judgment on Macaulay! Pshaw! the absurdity is too patent. Your language-dissector as a rule is a man who could not write ten pages of description or explanation (that any one could read with pleasure or profit) to save his life. He always strikes me as trying to find out why *he* can't write as well as Macaulay or any other man.

MARK TWAIN is an author; but somewhat raw in style. Albeit, I prefer not to use double "haves" in sentences where they hurt the ear. It is easy to avoid them, without confusing the sense.

I SEE from the *Daily News* of the 22nd that the readers of the American *Critic* have been extending to this country the system of balloting, by which they settled who among American worthies should form an Academy of Forty, if one were established on the model of the Académie Française. I have myself an intense dislike to all such selections—a dislike based on the sound general principle that "comparisons are odious," Why should I trouble myself to set in order of merit the poets, or historians, or novelists, or men of science, whose works delight me? Even if I do this in my own mind why should I publish my results (very likely wrong) in such sort that they may reach the ears of those whom I have thus attempted to weigh? The American Forty, for instance, does not include E. Eggleston, Prof. Young, Marion Crawford, Prof. Newcomb, Joaquin Miller, or Prof. Youmans. Why should they be thus as it were told that in the opinion of certain thousands or tens of thousands of their countrymen there are forty better men than they? Some of them may know (as *we* know of them) that the very quality and value of their work puts it above the appreciation of "the general." Still it is not necessary even to tell a man that you cannot follow him.

OF the British list it is only necessary to remark that it does not contain the names of Dr. W. B. Carpenter, Sir George Airy, Dr. B. Richardson, and others as widely known; Lord Lytton is put in, I think, under the mistaken impression that Bulwer Lytton is still alive; and I imagine that for Sir H. Thompson, the eminent physician, we should read Sir W. Thomson, whose name on account of his connection with Atlantic cabling is widely known in America.

NO man of sense stops in his work to ask how his work is valued. "What thy hand findeth to do, do it with thy might" is a sufficient rule; and it is only the childish or the senile who wonder whether they are adequately appreciated. The author who writes because he has something to say, does not wait to be patted on the back; the speaker whose heart is in his words does not wait to be applauded: why should the busy workers be invited to notice that the world or a part of the world is watching them and weighing their work,—or omits to do so?

Reviews.

SOME BOOKS ON OUR TABLE.

Dictionary of the Names of British Plants. By HENRY PURFOY FITZGERALD. (London: Baillière, Tindall, & Cox.)—Mr. Fitzgerald may be congratulated on the production of a work which, in hackneyed phrase, really does "supply a want," and, we may add, supplies it admirably into the bargain. Into ninety pages he has compressed the names (generic and specific) of every British plant, together with their pronunciation and meaning. Considering the condition of botanical nomenclature, with its hash of dog-Latin and bastard Greek, the value of this little book to the student must be apparent at once. The very explicit directions for pronunciation will be welcomed by many whose knowledge of the plants themselves is often decidedly in advance of their ideas of how their names should be articulated. The study of this capital little book may save well-meaning people from

speaking, as we so very frequently hear them do, of clemátis, gladiólus, and the like.

The Revival of British Industries. By a Candidate. (London: James Bolton. 1885.)—The object of this "Candidate's" pamphlet is to show that free trade has broken down; for the simple but sufficient reason that, like the Irishman's reciprocity, it is all on one side. British manufacturers and farmers are, our author contends, shut out of foreign markets by practically prohibitive protectionist tariffs: while manufactured goods from the countries which enact them are let into this country free. British industries are, according to "A Candidate," to be revived by putting an *ad valorem* duty of 50 per cent. on manufactured goods coming from foreign countries. Food and raw materials to be admitted free. Out of the revenue thus raised it is proposed to pay a subsidy of £1 per acre on all land in the United Kingdom which is sown with wheat. The author further suggests absolute free trade between England and her own colonies and dominions; in fact, the formation of the entire Empire into a customs league or Zollverein, all adopting the 50 per cent. duties on foreign manufactured goods. Details will be found in the pamphlet itself.

The Autobiography of a Whitehead Torpedo. By "Guns." (London: Offices of *Engineering*.)—Everyone who wishes to obtain an intelligent idea of the internal economy and mode of action of the so-called "torpedo," which is (as its votaries assert) to revolutionise marine warfare, should buy the pamphlet before us, straightway. Obviously written by a man in the Naval service who has apparently passed through both the Greenwich and the "Vernon" course, it contains by far the best popular account of the Whitehead torpedo that we have seen; and as the details of its construction and use are incorporated in the well-told narrative of its adventures, the account possesses an interest which would scarcely pertain to a mere series of diagrams and descriptions. The supposititious breaking of the blockade at Toulon and the descent of the French Fleet on Malta are uncommonly cleverly told. A very pregnant warning, to which it is earnestly to be hoped that the authorities will give heed, is uttered by "Guns" in connection with the hushing-up of accidents and miscarriages which have occurred in torpedo trials. Nothing can be more absolutely essential to the success of so delicate and ticklish a weapon than an intimate knowledge of its weaknesses and defects, by all those concerned in its use and manipulation.

Studies in Microscopical Science. Edited by Arthur C. Cole, F.R.M.S. For August, 1885. (London: Baillière, Tindall, & Cox.)—Mr. Cole this month gives us illustrations, with descriptions of the structure of Antheridia in Polytrichum, of the Gill of the Anodon, of Tuberculosis in the human lung, and of the Mouth of the Tadpole. When we add that these are all as good as ever, the practical microscopist will know what to expect.

The Penny Alphabetical Time Tables, between London and all Parts of the United Kingdom and Ireland. (London: Wyman & Sons. August, 1885.)—This is a capital idea. The names of all the railway stations in the United Kingdom are given in alphabetical order, and under each one will be found a complete list of trains running both ways between the town specified and the metropolis, together with the fares, single and return. To many to whom "Bradshaw" is an inscrutable puzzle and a weariness of the flesh, this book will come (like the pens in the advertisement) "as a boon and a blessing."

Lindenblumen, and other Stories. By Rowland Grey. (London: Kegan Paul, Trench, & Co. 1885.)—"Rowland Grey's" really delightful book is made up of five stories, of which the fourth is selected as its title. Our own favourite among them is the second one, "The Doctor's Mascotte," than which nothing more charming has appeared for a long time. Graceful and interesting, their *vraisemblance* is not their least recommendation; in fact, we may say that with the (odd) exception of "Lindenblumen" itself, there is not one of these tales that contains anything which may not perfectly well have happened in real life. This volume forms a notable addition to the lighter literature of the season.

Once a Month; a Magazine for Australasia. Edited by Peter Mercer, D.D. (Melbourne and Dunedin: W. Inglis & Co.; London: Griffith, Farran, & Co.)—This magazine reaches us from the Antipodes, and is a creditable specimen of colonial literary work. Fiction, biography, travel, poetry, domestic medicine, gardening, science (a capital short article on Saturn, by Mr. Ellery), art, literature, chess, &c., make up a fairly readable number.

We have also on our table *The Lost Voice* (a song on the Ammoniaphone), *Guide to the Loan Collection of Musical Instruments, &c., Society, Bradstreet's, The Tricyclist, Wheeling, The Sidereal Messenger, The American Naturalist, Ciel et Terre* (with a conspicuous absence of *Ciel*), *The American Druggist*, and *The Country Brewer's Gazette.*

Rather more than a year ago the American journal, the *Critic*, asked for the opinions of its subscribers as to the forty Americans who, in the event of the establishment of an American Academy, after the model of the Académie Française, would be first entitled to become members of it. After the voting papers had been carefully sorted, it was found that the following names had received enough suffrages to qualify them for admission to the ranks of the Immortals: O. W. Holmes, J. R. Lowell, J. G. Whittier, G. Bancroft, W. D. Howells, G. W. Curtis, T. B. Aldrich, Bret Harte, E. C. Stedman, R. G. White, E. E. Hale, G. W. Cable, Henry James, Mark Twain, C. D. Warner, H. W. Beecher, J. F. Clarke, R. H. Stoddard, W. D. Whitney, Walt Whitman, Asa Gray, Noah Porter, John Fiske, T. A. Woolsey, A. B. Alcott, Julian Hawthorne, J. Burroughs, M. Hopkins, T. W. Higginson, J. G. Saxe, O. B. Frothingham, G. P. Fisher, M. C. Tyler, C. A. Dana, D. G. Mitchell, A. Winchell, E. P. Whipple, G. P. Lathrop, W. W. Story, and F. Parkman. The following writers—Marion Crawford, E. P. Roe, G. T. Curtis, Edward Eggleston, and Joaquin Miller, all of whom in this country are far better known than many of the successful authors—did not obtain sufficient votes to qualify them for a seat. This summer an imaginary British Academy has been formed by a similar process. The forty chosen ones are:—Lord Tennyson, Professor Huxley, W. E. Gladstone, Professor Tyndall, G. A. Sala, Mr. Ruskin, Herbert Spencer, Matthew Arnold, Sir H. Thompson, W. Black, Sir J. Lubbock, Duke of Argyll, Leslie Stephen, George Meredith, Sir Richard Owen, Cardinal Newman, Mr. Browning, R. A. Proctor, Mr. Froude, John Morley, Lord Dunraven, Henry Irving, A. C. Swinburne, E. A. Freeman, Walter Besant, Edwin Arnold, G. Macdonald, Justin McCarthy, James Payn, Mr. Wills, W. Morris, Professor Blackie, Archdeacon Farrar, Baring Gould, Wilkie Collins, Lord Lytton, Professor Skeat, Andrew Lang, Professor Gardiner, and Austin Dobson. Some great names are conspicuous by their absence from this list, but the selection is not, upon the whole, an unrepresentative one.—*Daily News.*

"Let knowledge grow from more to more."—ALFRED TENNYSON.

Only a small proportion of Letters received can possibly be inserted. Correspondents must not be offended, therefore, should their letters not appear.

All Editorial communications should be addressed to the EDITOR OF KNOWLEDGE; *all Business communications to the* PUBLISHERS, *at the Office, 74, Great Queen-street, W.C.* IF THIS IS NOT ATTENDED TO, DELAYS ARISE FOR WHICH THE EDITOR IS NOT RESPONSIBLE.

The Editor is not responsible for the opinions of correspondents.

All Remittances, Cheques, and Post-Office Orders should be made payable to MESSRS. WYMAN & SONS.

NO COMMUNICATIONS ARE ANSWERED BY POST, EVEN THOUGH STAMPED AND DIRECTED ENVELOPE BE ENCLOSED.

MAGNIFICATION NEAR HORIZON.

[1887]—I hope Mr. Proctor will not disdain to dispose of what I venture to offer in support of Prof. Le Conte's view, rather than of his, on this phenomenon (KNOWLEDGE p. 90).*

1. If these bodies have been measured, and found to subtend the same angle when apparently large as they do some hours after, when looking small, then I suppose, *causa finita est*; it is an illusion in very truth. Mr. P., however, does not say they have been so measured. [Have I not?—than I now say it—they have repeatedly been measured.—R. P.] If they have, the matter will always remain a puzzle to me, [!] for the following reasons (the test of the half-inch disk seems to me rather too rough a one):—

2. It is not by any means always, or in the majority of cases, that these bodies seem thus magnified. I have seen them approach the horizon hundreds of times, not undergoing this change of appearance.

3. It is not only the heavenly bodies which are magnified by certain states of the air. Thus, I sit down on the rocks and gaze at the opposite coast ten miles distant. I see the beach, but I do not see houses, mills, hedge-rows even. I read for an hour, and on rising to go, am astonished to find that, without any apparent change in the air, I now do see all these things, though my sight is fatigued by reading, as though I had gone three miles towards them in a boat. It is certainly not refraction which has done this, because I saw the beach at the beginning; the objects then too small to be seen were, therefore, in the field of view all the time. One day on the jetty at Boulogne, in bad weather, I remember seeing a church some distance inland in Kent. Now, on very clear days the cliffs are visible, but no buildings. How could refraction, by merely throwing up the object, make it visible, when a similar object, much nearer, is not so? [I will not pretend to explain an observation which has been made by another, and with the details of which I am not fully acquainted. But in such abnormal atmospheric conditions as are involved in cases of mirage, magnification is quite possible.—R. P.]

4. I may deceive myself; but I have always thought I saw, when the moon is so broadened, details on her surface which I do not usually see with the naked eye. Likewise, I have seen spots on the setting sun which I hardly think are visible when he was high up.

5. The eclipsed moon looks very much smaller than before; this is due to the absence of radiation [!]. Now, when she rises faint and cheese-like in the daylight, before the sun is set, she is free from radiation also, and should look smaller, as when eclipsed. This should at least counteract the other illusion. But it does not; *ergo*, &c.

6. I agree that comparison with other objects cannot be the cause; because, if we are in a deep valley, yet gently sloping, the moon rising above our apparent horizon does not undergo this change.*

7. I cannot agree with Mr. P.'s belief about the apparent shape of the sky. When there is driving scud, of course, the clouds overhead do look nearer than those lower down, because they go faster, and we instinctively conclude thence that they must be nearer, as, indeed, they are. (Also, they are vaguer and fleecier, and we get the idea that these details must indicate nearness.) But, as regards a clear sky, I cannot say the part overhead looks nearer than any other; rather the reverse. The same with an even dull sky. Both that and a clear one do give me the idea of a lime hemisphere. (In 1873 I went, with French friends, into a cyclorama of the siege, at Paris. It was a dome—of course, a true hemisphere—painted cloudy; the environs of Paris were so well perspectived that, at first, one could hardly credit it was but a show. There were two boys—of eight and thirteen—with us, and for some time we could not convince them that the dome was not the real sky. I think this goes to show that the common conception is of a hemisphere.)

8. My own conclusion always has been that dew, fog, or rain in the air does magnify; but if the micrometer positively disproves this, throwing us back on the certainty of illusion; then, at all events, I urge that (2) *supra* shows that we have not arrived at the *vera causa*. HALLYARDS.

* Are there not two slips of the pen. "Nay, she looks rather smaller when near the horizon, being then nearly 4,000 miles nearer to us than when overheard." For "nearer to" read "further from"? Again, *infra*, "is larger when low down than she is when high above the horizon, though in reality occupying as large (nay, even a slightly larger) portion of the visual field." Here should not we insert "when high" after "occupying"? [Quite right, in reply to both points.—R. P.]

"DOUBLING UP YOUR HAVES."

[1888]—I am very glad to find that Mr. Proctor does not really defend the phrase, "I should have liked to have seen." (In my letter, 1881, the compositor omitted the "d" in liked.) I see that Dr. Hodgson, in his "Errors in the Use of English," speaks of "the error of using the perfect form of the infinitive, for the simple or indefinite form, after a perfect verb," and says that, "in making a present statement past, only the principal verb need change its tense." He then goes on to give examples of this mistake from the writings of well-known authors, including Sidney Smith, Shelley, Sir S. Romilly, John Ruskin, F. W. Farrar, H. L. Bulwer, W. S. Landor, &c. This formidable array of names almost neutralises the previous condemnation.

Mr. Proctor says he never uses the phrase I object to, and I have certainly never detected it either in his writings or in his lectures. I was, therefore, the more surprised to see that he, as I thought, approved of it in certain cases. But I am glad that I was mistaken. E. C. H.

P.S. What Mark Twain says on this subject is as follows:—"Harris said that if the best writer in the world once got the slovenly habit of doubling up his haves, he could never get out of it while he lived. That is to say, if a man gets the habit of saying 'I should have liked to have known more about it,' instead of saying, simply and sensibly, 'I should have liked to know more about it,' that man's disease is incurable. Harris said that this sort of lapse is to be found in every copy of every newspaper that has ever been printed in English, and in almost all of our books. He said he had observed it in Kirkham's Grammar and in Macaulay."—From "A Tramp Abroad," by Mark Twain.

MISPRONUNCIATION.

[1889]—When first I had to study the elements of philology, with a view to teaching them, Grimm's law burst on my understanding as an absolutely new idea. "Trench on Words," and similar books, had prepared me for the wonderful fertility of roots and curious derivations; but, although I had learnt at school that care was more nearly connected with *gravis* than *cura*, and I had heard much about the digamma, the idea that one people systematically pronounced as *k* what their neighbours pronounced as *g*, and *vice versâ*, had never entered my head as possible, much less probable. My idea was that mispronunciation occurred from laziness or inability to pronounce a certain letter, *e.g.*, the Portuguese and the letter *h*. But, as a rule, it is evidently not so. The cockney who tells one that "the 'orn 'as been 'eard on the 'ill" takes particular pains to "hexplain the hillness of his haunt." The Roman, too, who used the word "granum" also made use of the word "cornu." It is not, therefore, an inability to pronounce a letter, but rather an inability to re-pronounce certain letters from the lips of a foreigner. While in India I had a certain amount of experience in teaching young natives English, and many of them came to me knowing absolutely not a word of it, so learnt their first pronunciation of a word from

* Apropos. I read in a French paper that one effect of the earthquakes in Spain at a certain place had been to make the sun rise half-an-hour later every day. This, at first sight, recalling Joshua, or the famed earthquake pills, is, of course, quite correct, the mountain-range to the east of that town being elevated.

XUM

me. I mention this as, of course, some of the English-speaking native masters themselves mispronounce. In every case that came before me the boy on the first attempt pronounced "wool" as "ool," yet the sound of w is distinctly heard in one of their commonest pronouns "woh." Another common mispronunciation is to place a short vowel before double consonants, such as sp, st, sm, &c

It is most amusing to hear a conscientious native master trying to correct this fault. "Don't say *is-spot*; say like me *ispot*." A very peculiar mispronunciation, not made by the natives, but by uneducated Europeans in India, is the substitution of the English *a* for the vernacular sound of *u* in tub. It is true that in some of the later systems of transliteration this letter is represented by *a*, but the uneducated European does not know this, he gets his pronunciation from the camp-followers and others that hang about cantonments. One of the commonest words in use among the natives is *abhi*, meaning "now," pronounced ub-hee by themselves, but by the British soldier, *abbey*. No native would dream of pronouncing it so. Of course one does not expect the untrained ear to distinguish between dental and palatal t's, or between g and gh, and suchlike, but there seems something odd in words which are constantly heard as saláam, ubhee, gháriwán being invariably pronounced as slam, abbey, and gărriwann.

I have collected a few words from Raja Siva Prasad's "Hindi Grammar," which he gives as words in common use among the natives, but derived from English. They are, I fear, too few to draw any conclusions from, except that the liquids seem interchangeable. I have added a few words I have noticed myself, but they do not help. From the list of mispronounced names which I have added, it is apparent that the native tries to connect some meaning with the name, but the list is chiefly interesting in showing his ingenuity in so doing. Some mistakes, most amusing to those who know better, are made by tourists in India in the pronunciation of Indian names, such as Benairs for Benares, Oodh for Oudh, Peshawár for Peshawur, Cabool for Cábul, &c.

List of words from Raja Siva Prasad's Hindi Grammar:—Box, Bukkus; Breakvan, Brikbân; Button, Bŭtâm; Bottle, Bótŭl; Bag, Bég; Decree, Digree; Engine, Unjun; General, Jernél; Lantern, Lâl-tén; Lamp, Lump; Lord, Lât; Longcloth, Nainkilât; Number, Lumber; Note, Lote; Special, Ispésbal; Stamp, Istâmp; Tandem, Tumtum.

Additional list:—Baby-girl, Beebee, which really means lady; Baby-boy, Bâbâ, which really means son; Madam-sahib, Memsahib; Coachman, Coachwân; Peg—*i.e.*, Tent-peg—Meg; Champagne, Simpkin.

List of transformed names:—Alexander, Alekjullunder; Bradford, Brass pot; Bartlet, Bottley; Bartle Frere, Bottly Beer; Brown or Burn, Brune; Coles, Kuola, meaning charcoal; Abercrombie, Bikram, meaning goat; Mackintosh, Mukkun toost, meaning butter and toast; Johnson, Jân Sén; Thomson, Tâm Sén; Smith, Ismit; Vanzulicum; Bijli, meaning lightning.

There are, of course, many others, but I cannot recollect them at this moment.

Jos. W. Alexander.

THOUGHT-INDUCTION.

[1890]—I am reminded by an article in the summer number of *Mayfair*, entitled "Telepathy," of a very popular argument against those who think they see some resemblance between Electric (or Magnetic) Induction and an induction of ideas which they affirm does sometimes take place between two or more minds; and now that Mr. Irving Bishop threatens to bring another thought-reading action against Mr. Henry Labouchere, this contribution to articles on the subject may interest those who have read with attention accounts of the former gentleman's late feats and failures.

Now it is a fact well known to all who have any familiarity with electricity and magnetism that an electric current in a body inductively affects the electric condition of all bodies in its vicinity, and that between a magnetic needle for instance and any other magnetic substance in proximity, there must exist an analogous sympathy, if I may use the phrase.

To illustrate these facts for the benefit of those who have not studied the matter, if two cables were stretched across the Atlantic, for instance, at a distance of, say, one yard from each other throughout their entire length; if certain electric signals were sent through one of these cables the same signals would be induced in the other and parallel cable, and might be observed at either end of the same, so that if a magnetic needle were moved into any position there would be a tendency for all magnetic substances in the vicinity to take up a new position as a result of such movement.

Now, as to induction of ideas. If such induction exist, can we reasonably consider that there is any resemblance between such induction and the electric or magnetic induction I have mentioned?

The author of "Telepathy" makes use of an argument which I have often seen adduced, but which I have never seen combated. "As for the analogy of electricity," he says, "it is wholly misleading. One magnetic needle acts on another at a distance, it is true, but the phenomena are regular and uniform. They are capable of exact prediction. They are, in short, matter of exact science." As for the alleged instances of thought-reading, I need hardly remind all who read this that they are very few and far between.

Now, to give the electric analogy a fair chance we should state facts correctly. To refer to the action which one magnetic needle exerts over one other at a distance, it is quite true that if we know everything about these two needles, and can place them where no third influence can bear on them, we shall be able to predict with certainty what will be the force exerted by each magnet on the other; but we must recollect that were the magnet we wish to act upon with one other magnet surrounded by other magnetic forces the effect would be the resultant of all the forces, and would in all conceivable probability not be equivalent to the effects of the one magnet by itself. Mesmerists sometimes ask their subjects to gaze intently on some uninteresting object, such as a plain zinc disc, in order to free their minds as much as possible from surrounding forces, so that there may be no conceivable force other than that emanating from themselves, the mesmerisers, brought to bear on the subject's mind. And if once we agree that one mind is inductively affected by another, we shall surely not have to give up the electric analogy for any reason yet assigned. We shall rather understand why cases of thought-reading, clairvoyance, and the like, are so exceptional instead of being the rule. The mind would have to be abnormally free, so to speak, or the one force which was to make itself felt would have to be so correspondingly powerful as to be able virtually to annihilate the resultant effect of all the other inductions bearing on it.

But even assuming that we could believe in the doctrine of Telepathy, we can hardly expect that cases of clairvoyance or thought-reading can ever become frequent. What an infinite number of factors make up the resultant force which determines a man's thoughts and actions! As every successive wave dashes on the rock, the spray in fury lashed assumes each time a different form. Who will predict the form which the spray shall assume next time the wave shall break? Yet if we knew the angle at which the wave would strike, as well as its shape and volume, the force and direction of the wind, and all the other elements or factors, we could draw an accurate prophetic sketch of the resultant. Is it therefore too much to assume that if we knew all the factors in the case, we might determine what a man's thoughts or actions would be under any given circumstances, if only we could work out the sum thus set—given the forces, to find the resultant?

In conclusion, I would remind all that we cannot positively aver that such is not the case, and I feel confident that such a belief could only work good. Our hatred of evil-doers would give place to pity for them, and thankfulness that circumstances have rendered us happier in our actions, and we should be filled with a desire to do our utmost to make that greatest factor in the world's good—knowledge—attainable by all.

Herbert Kingsford.

MENTAL DEVELOPMENT.

[1891]—"Later on, Greek art, like art everywhere, declined, and, with occasional . . . . exceptions, never revived again."

This is so true a truism that it is not worth while to annex the reference.

Not in Greece only, but *un peu partout*, we see material proofs of the decline of man as regards art. Where are the artists of Baalbec, Nineveh, Luxor, Stonehenge, Yucatan, Easter Island, Cambodia? They all, in some respects, excelled us Europeans, who are a compost of the Italian, Celtic, and German savages of old. We have excelled them in a hundred ways; yet not in art. Is man never to be *universally* superior; not perfectible; now emerging, now submerged, like the shell he dwells on?

The idea might be carried much further. Thus, civilised man is less able, in many things, than the savage. Man, everywhere, is in many respects inferior to the beasts. What he has gained in dominion over the forces of nature, he has lost in morals. No animal is so contemptibly malignant, so illogical, as man; or so ridiculous in his actions. I know a horse whose sole occupation consists in pulling round and round a number of models of his species, on which are seated numbers of ours—not models, but grown-ups, as well as children, "all alive oh!" to the accompaniment of an extended repertory of *four* opera airs. I fancy I see in his eyes (and ears) the sentiment "How sad is my lot, to have fallen under the yoke of creatures who are not even sane!"

There was an old Frenchman who had a donkey, which he systematically ill-treated. One evening, as soon as the last bit of

harness was removed, the ass turned round, floored his master with a well-planted kick, and then leisurely and systematically kicked him all to pieces. If I had been by, I should not have interfered. Turn and turn about is surely fair play. I saw a man the other day beat his horse till he could strike no more; it could not stir a too heavy load of sand. Then he shouted to some fellow-brutes to lend him *two more* horses. Then he turned to contemplate his own beast. I thought he was moved with compunction. Suddenly he roared "*Sacré cochon!*" and struck his beast *again!* Don't talk of human superiority after that. HALLYARDS.

MEAN-TIME SUN-DIALS.

[1892]—The following hints may be acceptable to those who wish to set up mean-time sun-dials. The construction, though not mathematically exact, is, I think, sufficiently so for all practical purposes.

I premise that the reader is already acquainted with what has appeared in KNOWLEDGE on this subject.

I would not have the radius of the hour-circle more than six inches, or the shadow of the gnomon will be too indistinct.

The axis of the gnomon may be a stout steel wire. The waist may be made as thick as is necessary for strength, as this can be allowed for on the hour-circle. I mean to try if plaster-of-Paris will do for the material of the gnomon itself.

I do not see any special reason for making the two bulges of the gnomon of equal diameter, and I propose, in drawing the curves, to use as simple formulæ as possible.

The ordinates and abscissæ may be drawn from intervals of a week or ten days. For the latter multiply six inches by the tangent of the declination, for the former use the radius of the wire (waist) plus the sine of the equation of time.

The section of the gnomon when drawn might be transferred to a thin sheet of metal and cut out, so as to serve as a gauge.

I use one dial with two gnomons. The axes of the latter may be made as long as convenient, with their ends fitting into slots, so that they may be changed when required.

If the gnomon consisted of a cylinder of, say, a tenth of an inch diameter, it would cast a tolerably clear shadow of the same width, and, at apparent noon, the *axis* of the shadow give the twelve o'clock mark. It is necessary, therefore, to give the hour circle a movement round the axis of the gnomon so as to set the edge of the shadow to the exact time.

From Christmas to the middle of April, and from the middle of June to the 29th of August, the east side of the shadow has to be used; at other times the west. When the change of edge has to be made, the hour circle must be revolved the width of the waist of the gnomon. A similar motion is, of course, used (if required) to set the dial to any given standard time instead of local mean-time.

The gnomon and hour circle must be braced together, and the combination be capable of two motions—one round its axis, as just mentioned, the other in a vertical direction to set it for the latitude. The lower end of the gnomon (or rather its support) has a hinge, and the upper end is clamped to a graduated arc according to the latitude.

When my dial is finished I mean to test it from time to time by a chronometer.

I see that in my letter 1825 I inadvertently used the expression "sine of half the equation of time" for "sine of the equation of time." MUSAFIR.

OCULAR SPECTRA—THE RETINAL DECOMPOSITION OF LIGHT.

[1893]—It is very remarkable that Newton's celebrated prismatic experiment should be commonly regarded as the first demonstration of the composite nature of what is vulgarly termed *white-light*. The rainbow was Nature's demonstration of the same fact from all time. The decomposition of light by the prism, as well as by little water-drops, is attributed to refraction. The decomposition of light, however, has also been effected, from time immemorial, in a very different manner, without refraction—I mean by the optic sense, by the sentient human eye, as experienced in the phenomena, or spectra consequent on *sun-daze*. The duration of these spectra on the retina is of sufficient length to enable an observer to experiment with them, and to discover that the prismatic colours succeed each other in contrary order, as these may be experienced either in a dark or in a light field of vision. One of the most interesting experiments which may be made with these spectra is, that of turning the eye either from a light on to a dark field or *vice-versa*, when the spectrum of the moment will appear of the opposite or complementary colour, assuming its previous hue when the eye is again turned upon a light field. When this remarkable fact shall have been sufficiently considered in all its bearings, it will, in all probability, lead to some important changes in our theoretical conceptions.

1. If the sensation of a particular colour be due to a wave of a certain periodicity, how comes it that that wave period can be immediately changed into that of its complementary and back again within certain limits of time?

2. If what is usually called the decomposition of light be a veritable decomposition, this decomposition, it is evident, may be effected without refraction.

3. The decomposition, thus effected, is not sufficiently accounted for by the suggestion that the sequent sensations of colour follow each other according to the strength of the impressions made upon the retina by the respective component vibrations constituting white light, that is to say, the weaker fading first and the stronger last; for, if this were the case, the spectra would preserve the same order of succession whether in a dark or in a light field of vision.

4. Seeing that identical portions of the field of the retina may experience alternately, and almost simultaneously, opposite sensations of colour, these spectral changes must be due to the proportional relation of the excitement of those portions to their environment.

The most feasible explanation of the sequent spectra referred to appears to me to be offered by (4) viz., that those sequent spectra are intervals in the decadence of a strong initial impression on the retina, and that the different sensations of colour experienced are due to differences of degree rather than of kind, just as our different sensations of heat and cold are, and that just as in the case of temperature the sensation produced by any particular degree may be changed by juxta-relation to some other antecedent or consequent. W. CAVE THOMAS.

A TRICYCLE QUERY.

[1894]—Would Mr. Browning oblige by describing a tricycle suitable for a man weighing 16½ stone, fifty years old, and, consequently, not as active as he might be. A safe, easy-going, and tolerably swift machine (not for racing) is what is wanted. The Globe Lein seems to me to be about what is required. Am doubtful whether a single or convertible machine would be best.

SIXTEEN AND A HALF STONE.

SWANS FLYING.

[1895]—I send the following, as I think some of your readers are doubtless interested in natural history:—

At 7.40 p.m. I observed three swans [What kind?], at a fair elevation, flying in a direction from S.W. to N.E. Heads and necks were well stretched out; but, from the rate at which they travelled, they did not appear at all fatigued. H. A. MILES.

Aug. 14.

OIL-GLAND IN DUCK.

[1896]—Article "Philosophy of Clothing," p. 115. I think it would be well to finish one heresy before beginning another. I take it that it is well understood by most persons who would be likely to read this paper that down of the duck lies inside the feathers next the skin, that it encloses a large quantity of air, and that still air is an excellent non-conductor of heat; but this has nothing to do with the little organ in question, nor is the grease or yolk in the wool of the sheep an analogous illustration, as that applies to the whole surface of the body of the animal; nor does any of this prove the existence or non-existence of an oil-gland in the duck. Mr. Williams is not likely to find much, or any, oil on the down-feathers of the breast, as it appears to be mostly distributed on the external surface of the outside feathers; but if Mr. W. will catch his "loving and faithful duck" again, and examine the other end of the bird, he will find that he can press out of the nipple before-mentioned a yellowish thickish substance, which, if not oil, is certainly greasy, and at times the feathers in the neighbourhood of the organ are so moist and slippery from the same that they cannot be plucked out by the fingers. Moreover, a domestic duck, unlike a fowl, is not an animal "usually infested with fleas," as Mr. W. states (am sorry to disagree with him again), provided that it is not kept in confinement and has plenty of water.

In "North American Birds," by Elliott Cones, date 1872, at page 5, I find an anatomical description of the oil-gland (too long to insert here). "Bird Life," by Dr. A. E. Brehm, date 1874, page 10, a shorter description. "Zoology," by H. A. Nicholson, date 1870—lecturer on Natural History at Edinburgh refers to it (page 268) as an organ of great development in the order *Natatores*, by means of which the dense plumage is kept constantly oiled. And "Anatomy of Vertebrate Animals," by T. H. Huxley,

XUM

at page 275, distinctly states that it is an organ for the secretion of an oily fluid which the bird spreads over its feathers by the operation of pruning, and speaks of it as generally understood and without a doubt. Besides which a duck and a dissecting knife are quite sufficient to prove the correctness of the above quotations, or even without the knife. G. A.

ILLUSORY TRANSFORMATION OF INTAGLIO SCULPTURE INTO APPARENT BAS-RELIEF.

[1897]—A very pretty object for experimenting in this illusion is found in the reverse side of the embossed "Queen's head" or postage-stamp impressed on stamped envelopes, and it will be interesting to many of your readers to examine such an object both by daylight and by artificial light.

Unless my experience is exceptional, it will be easy for observers to cause the image of the features to appear to assume the more familiar aspect of a convex or rounded surface instead of their true shape of a concave or hollow, and, aided by this illusion, to fancy that the hollowness of the engraved oval lines by which it is surrounded is transformed to an untrue solidity. In all these effects there is a false supposition of the illumination being in the opposite direction to its real incidence, or, rather, at an unequal angle, but on the opposite side of a perpendicular to the general surface of the paper. The human face being such a constant object of observation not only during our own lives, but throughout the long experience of the race, while hollow-moulds of it or of other familiar solids are rarely seen, it is much easier to fancy that the hollow cast is solid than the reverse. In fact, though in close proximity to the intaglio, and while it appeared to stand up in beautiful relief, yet it was impossible to depress mentally the features on a coin laid upon the paper. It will also be observed that contradictory results may be observed by introducing a few indentations in the paper or throwing sharp shadows upon it, when, though the over-mastering familiarity of the features enables us to hold them to the fancied *relievo* appearance, yet these mouldings, wrinkles, depressions, &c., retain their true aspects, and wholly or for a time refuse to be transformed, and the surface appears to be lighted from opposite quarters simultaneously. It would also appear that monocular vision and slightly unfocussed vision are favourable to the inversion of the perception, and that slight crossing of the axes of the eyes, or causing them to be directed to vision "at infinity," helps to form the illusory conception. J. Greevz Fisher.

MUSICAL TEMPERAMENT.

[1898]—In my last letter I left it to be inferred that to take any notice of such a difference among the ratios of vibrations as that between 8 : 9 and 9 : 10 was something as irrelevant to music considered as an appeal to the understanding, as it would be in criticising an architectural work, to make a microscopic examination of the bricks to see whether they actually corresponded to the *beau idéal* of a brick. But it may now be well to collect and compare a few conflicting authorities.

The late General Perronet Thompson contrived a most ingenious and complicated organ for playing in a variety of keys, with scales justly intoned; and he wrote a book upon it full of curious information, which went through several editions. To his feelings, just intonation and equal temperament seem to have been opposed, as truth to falsehood, right to wrong. He says: "If a sculptor, instead of making fingers of the various lengths nature has made them, should determine to make one medium length serve for all, this would be a temperament." . . . . . "It is as if sailors and astronomers were invited to employ telescopes fixed to one length for all eyes and distances, like those sold for children in the toy-shops" (General P. Thompson's "Just Intonation," 7th edition, p. 45). "The misery of temperament must be got rid of. . . . ." (p. 50). "Singers sing to the pianoforte because they have bad ears, and they have bad ears because they sing to the pianoforte" (p. 94). "The tenth of an inch may in some senses be called small; but it is a mountain in the edge of a razor or the nose of a profile." . . . . "As it is, the singers and violists live in a constant struggle with the temperament, and get rid of it as far as they are able, though a portion sticks by them in the shape of accustoming their ears to what is out of tune." . . . . "Instead of being a 'slight imperfection,' it is ruinous to all approaches to perfection; a man might as well try to shave himself with a handsaw, and persuade himself he liked it" (p. 95).

General Thompson had his sympathisers. He quotes from De Morgan, "The system of equal temperament is, to my ear, the worst I know of." One enthusiastic young lady said, "But for this organ" (General Thompson's) "I should never have known music. I did not like it, and could not understand it." "It's quite a treat!" exclaimed a professional tuner, after tuning the just instrument: "When I have tuned my chords in a tempering organ I have to make them say *Wow, wow, wow*, for the temperament." ("Just Intonation," pp. 96, 47 and preface.)

To turn away from General Thompson, I quote Helmholst, in his chapter xvi., "The System of Keys," of his great work, the "Sensations of Tone," &c., as translated by Mr. Ellis:—"There can be no question that the simplicity of tempered intonation is extremely advantageous for instrumental music . . . . But it must not be imagined that the difference between tempered and just intonation is a mere mathematical subtlety without any practical value. That . . . the early musicians, who were still accustomed to the perfect intervals of vocal music . . . . felt the same, is immediately seen by a glance at the musical writings of the latter half of the seventeenth and the earlier part of the eighteenth centuries, at which time there was much discussion about the introduction of different kinds of temperament" . . . . "Whoever has heard the difference between justly-intoned and tempered chords can feel no doubt that it would be the greatest possible gain for a large organ to omit half its stops, which are mostly mere toys, and double the number of tones in the octave, so as to be able, by means of suitable stops, to play correctly in all keys." (N.B.—The translator demurs to the absolute accuracy of this.) "Down to the seventeenth century, singers were practised . . . . with a degree of care of which we have at present no conception." . . . . "But it is impossible not to acknowledge that at the present day few even of our opera singers are able to execute a little piece for several voices . . . . unaccompanied . . . . in a manner suited to give the hearer a full enjoyment of its perfect harmony." Professor Helmholst here instances the trio for the three masks in "Don Giovanni.") . . . . "When the intonation of consonant chords ceased to be perfect . . . . it was necessary . . . . to have recourse to a frequent employment of harsh dissonances . . . . to replace the characteristic expression . . . . These are unpleasant symptoms. . . . . Our last greatest composers, Mozart and Beethoven, were yet at the commencement of the reign of equal temperament." (Ellis's "Helmholst," 1875; pp. 498, 504, 508, 510, 511.)

*** An opposed view will require a future letter.

A. O. D.

THE CORRELATION OF THE TWO COMMON CHORDS OF MUSIC, AND THE BINARY CHORDAL STRUCTURE OF THE MUSICAL SCALE, AS ILLUSTRATING EVOLUTION.

[1899]—In letter 1850, reference is made by "Gamma" to the serviceable use which is frequently made of music for the purpose of illustrating the character and mode of nature's processes; and as, in connection with that subject, I think I am able to add something to the existing store of knowledge, I am induced to offer my humble contribution.

If not well-known to all, it is at least easily found that the first six numbers, viz., 1, 2, 3, 4, 5, 6, represent the ratios of the major chord in a complete form. Take, for instance, the major chord of C; C_1, C, G, c, e, g. Observe that there are present in it, in ascending order, the harmonic intervals the octave, the fifth, the fourth, the major third, and the minor third. When it is stated that the six numbers above given represent the ratios of the major chord, it is of course understood to be signified that with one vibration of the fundamental note C_1, two vibrations of C coincide; three vibrations of G, four vibrations of c, five vibrations of e, and six vibrations of g.

So far we have come upon nothing new. To what follows, however, I think I must ask for a little heedful attention, for though it is not a matter presenting much difficulty, it is one, I have no doubt, now presented to readers for the first time.

As the numbers 1, 2, 3, 4, 5, 6, are the ratios of the major chord, so are their reciprocals 1, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, the ratios of the minor chord. To instance the minor chord as represented by these ratios, let us take that called the minor chord of A, which appears as e^1, e, A, E, C, A_1. In this chord the series of the harmonic intervals again appears, but in contrary, that is in descending order, viz., the octave, the fifth, the fourth, the major third and the minor third. The interpretation of these reciprocal ratios in relation to the minor chord is this: the uppermost note e^1 is the note of origin, or, of the unit, and there coincide with its single vibration one half of a vibration of e, one third of a vibration of A, one fourth of a vibration of E, one fifth of a vibration of C, and one sixth of a vibration of A_1.

It is thus shown that the relations of both the major and minor chords arise equally from the simplest origin, that is, the unit, the single vibration; and that these relations with this unit are of equal simplicity. And we here observe that of these two chords

the whole system of scales, modes, changes of key, &c., are undoubtedly built up. Into this part of the subject we now pass.

It is a matter of experience that all the notes of each chord may be sounded together, and in each instance the effect produced is harmony, but harmony however of a different quality, easily distinguishable, and known as major or minor. But the effect of harmony is destroyed if both chords are sounded together. They are not competent for this kind of union. But there is a kind of union of which they are susceptible, that is the union which consists in the immediate succession and alternation of the notes of the two chords amongst one another, the result being song, tune, or melody. We purposely omit to speak of the heightening effect of rhythm in music, which is not requisite to take notice of here.

We therefore now see how the scale is built up. It is by the affinity of chords which have one or two notes in common. Such the affinity is between the two chords we have been employing by way of illustration. The notes c and e are common to both. By uniting, then, these two chords we obtain a considerable portion of the diatonic scale, that is, one half of it, viz., (omitting octaves) C, e, g, a. The remaining half is thus obtained:—Upon G erect another major chord. Reduced to the brief four of a triad, this chord is g, b, d'. This d must be called d acute. It is the acute second of the key of C. Likewise join to A of the minor chord described another minor chord. Reduced to its triad form this new minor chord is a, f, d'. This d must be called d grave. It is the grave second of the key of C. The two forms of the second of the scale differ by the ratio 80 : 81.

This second pair of chords conjoined to the former pair complete then the construction of the diatonic scale, which in the key of C consists of these notes, as placed in one octave, C, d', d', e, f, g, a, b, c, the respective ratios of which are 1, $\frac{10}{9}$, $\frac{9}{8}$, $\frac{5}{4}$, $\frac{3}{2}$, $\frac{5}{3}$, $\frac{15}{8}$, $\frac{2}{1}$.

But the diatonic scale is not the only scale; or, to speak more definitely of its nature, it is only a part of a continuous system of notes. It is, however, the most important part; in fact, the one necessary parent stem, of which all other scales, keys, and notes not contained within it, are but as branches and leaves growing naturally upon it. These ramifications result from the mere continuation of the process by which the diatonic scale is formed, to wit, the bringing forth of new chords, both major and minor, upon the notes of already produced chords. Whatever be the form of scale or new note which may appear in examples of music, it is of necessity related to the keynote, and its correlative by an unbroken chordal linking that has existence in one direction or another.

It will be proper to say a word or two in connection with the liberty, which we have taken for shortness' sake, of condensing the notes within the limits of a single octave instead of detailing them in their respective positions in the order of the chordal development which determines them. Let it then be seen that this is done in strict accordance with the principle of simplicity of development; for, as in practice, a note and its octave are so much alike that they are regarded as being in unison; that is, in one sound, their agreement being of the next degree to that of notes of the same pitch, so is their mathematical relation the next to the ratio of unison 1 : 1, viz., 1 : 2, or 2 : 1. And it is to be further observed that the replication of this ratio or interval produces no change of key, which, we find, is effected by replication in the case of either of the other intervals. It is, therefore, quite legitimate, having determined a note, to place in the scale any possible octave of it.

Such, then, as an illustration of evolution, is the structure of the musical scale, which, however, it should be borne in mind, defines in reality the power of a measuring faculty or instinct, an instinct that measures sounds, the successful exercise of which affords pleasure to the soul, or emotional faculty.

Hence it appears that our faculties are also subject to the law of evolution, the principle of which may be defined as simplicity of departure from oneness of origin to manifoldness of result. This is abundantly found in the processes of physical nature. Take, for instance, the phenomenon of crystallisation. First there is the indivisible chemical unit, the atom; then the union of two atoms forming the molecule; next the aggregation of molecule to molecule building up the symmetrical crystal; and lastly, an irregular conglomeration of crystals united facet to facet. Thus there appear, first, oneness; then symmetrical duality; then diversity, still showing symmetry; and lastly, complexity not characterised by any necessary extension of symmetry.

Another point in the evolution of the scale to be remarked is the reciprocal nature of its duality, which appears as an economy in its construction, whereby a maximum of effect is brought about with a minimum of divergence; for by the addition of a single note to either chord the other chord is imitated.

To this inherent duality of the musical scale many analogues in nature might be adduced. There is one, universal in organised nature, which it may be of interest to mention—that is the division of sex.

In conclusion, I would remark that whilst the scale is thus shown to exemplify the law of evolution, it equally appears to exemplify design in nature, teaching, in fact, that evolution is the one simple mode according to which the purposes of nature are fulfilled.

FRED. J. JACKSON.

LETTERS RECEIVED AND SHORT ANSWERS.

JAS. BROWN.—The explanation of saltness of sea in "Chambers's Encyclopædia" is unsound. The salts which form ingredients of the crust have been derived from the sea. Doubtless the saltness of the sea is due to the presence in the earth's primæval atmosphere of those elements now found in the sea.—R. G. L. Quite agree with you.—F. W. H. The subject is disposed of. If nothing is anything to man until he becomes conscious of it, I opine that to 999 out of 1,000 readers of KNOWLEDGE, Hylo-Idealism is naught.—ATLAS.—Dr. Wigan's book is long since out of print. I believe it was originally published by Longmans.—CONSTANT SUBSCRIBER. Do not know the address. An editor has usually a good deal to do besides looking after such matters.—S. G. Only the feeling that it is best to say no more on a subject which should not have been touched on, prevents me from publishing your just and well-worded remarks. Ten lines of her writing outvalue all that those Pharisees (who can only judge, however, from their inner selves) have done of good in all their lifetimes. — HILTON FULCKE. The book is anonymous. Try the publishers, Baillière, Tyndal & Cox.—R. M. D. As a very busy man I cannot undertake to make the necessary inquiries. Note advertisements in our columns.—ZETEO. Of course. Or, Assume a finite line,—it can be produced, and produced again—for ever.—BOYD MOSS. Have not read that book. There is so much to be done in this world, that those outside inquiries do not invite me. On the other point, it is the "popular conception" which overlooks that—not I. *My* ideas on the subject have no contact, even, with the popular conception. But what can it matter to the world what I think? That is the great nuisance of such subjects; they set a lot of unwise folk eagerly telling the world what *they* think—as if it mattered.—J. R. CORDER. I am not the publisher of that work or of any other; do not know its price, or exact name.—COMMENTATOR. Readers object, and naturally, to disquisitions so exuberant and dealing so wildly with so many subjects. A change is preparing which will leave very little room for correspondence, and none for replies in the KNOWLEDGE of the future. We begin by eliminating letters running to extravagant length, and too variegated in texture. Your suggestion that we should go through your letters and select what is best is all very well; but in the words of the good Bishop Peter of Rumtifoo, how about "*Time* my Christian friend?" As for the question you ask about General Grant, I know nothing about General Grant's private character; nor if I did should I deem it right to say anything about it. My own private personal character is quite enough to look after. Garfield's misdemeanours were public. He was not only publicly accused but publicly tried and publicly condemned. Americans may satisfy themselves with the idea that his subsequent election to the presidentship did away with that public condemnation by the chief law-courts of the land. That is their affair. If they like stained men for chief rulers, we need not be concerned. But private faults should be kept private. Anything more disgraceful than the attacks made on the private personal characters of Messrs. Blaine and Cleveland can hardly be imagined. Yet the tone of our own party papers grows constantly lower and more vulgar where they deal with personal matters—and unfortunately we have few but party papers.—HALLYARDS. Your letter of the 18th came direct to me (R. P.). I refrain from conveying to my friend the acting-editor the advice you kindly proffer him. I do not think the letter you refer to can be rightly described as offensive; certainly the editor did not so regard it. Anyway I am responsible for omitting part of your reply. If you do not know, I *do*, that such remarks as you quoted, however seemingly with ridicule, about myself, would have an effect to which I might very properly object. You did not even correct what was untrue in them (I cannot but fancy there was a little spite in that paragraph—as in your suggestions to the acting Editor); and though the acting Editor would have done that, I prefer to be neither insulted nor defended in my own paper. For your personal information I may remark that I am not a B.A. of London, or of anywhere else but Cambridge. As for your "opposition" to my views, your remarks about bodies moving in straight lines showed too complete an ignorance of the elementary laws of physics to be regarded as seriously in opposition to anything—except known facts. Most emphatically your letter headed "Exit Hallyards weeping" cannot be admitted without alteration; but your other alternative suits the case exactly; with or without

your alternative suggestions, the letter would certainly have been "omitted entirely." It must be gratifying to be so well assured of the obligation under which you have placed us. I had an idea the obligation lay the other way. I could show you a round dozen of letters suggesting that *this* obligation had been carried too far. A change which will take place in KNOWLEDGE a few weeks hence was suggested by this feeling in regard to yourself and one or two others, almost as much as by any other cause. You will be able to judge from its nature how *I*, at any rate, view the matter. Letter on "Light of Eclipsed Moon" omitted because corona is not red; moreover the corona's light is demonstrably small compared with that coming directly from the sun. In those matters *some* things are known, not matters in dispute. I never for instance regarded my remarks on Mr. M. Williams's ideas as more than an attempt to make some known matters clear.—H. S. HUTCHINGS. Mr. Proctor's lectures have never been printed,—or written: they vary from week to week, as knowledge grows.—L. E. You are quite right, of course: see "Gossip" for explanation of my strange mistake.—J. T. C. Darwin's "Descent of Man" is published by Messrs. Murray. I am not sure; but I think they have published a cheap edition. I hope so, for many reasons. Imagine such a feeble-minded person as you describe pretending to teach,—one might as well set a Mark-of-the-Beast coat and a white tie to tell men their duty,—only the coat and tie would have the advantage in being silent. I do not think the Acting Editor anywhere expressed the least objection to any one being a teetotaller. It was those who try to howl down the moderate drinkers he objected to. (By the way, why did you not finish the quotation from Sir Henry Thompson? Many agree with him in thinking that what is considered moderate drinking is often in reality excessive,—that, in fact, there may be mischievous excess without drunkenness being approached,—especially in the habit of systematic drinking. But the passage you partly quote bears a different meaning when complete than as you give it.) What I object to is the impudence of persons (not specially trained in medicine or physics) who pretend to tell grown men (myself amongst others) what we ought to do in such matters. Even when doctors talk about feeding, drinking, and some other matters, I note that they differ among themselves, and their practice differs often enough from their precepts; but they (some of them) *have* special knowledge. When Smith or Jones, with no more or perhaps much less experience than their fellows, tell Brown or Robinson (or R. P.) to drop their daily half-pint of claret, glass of beer, or wineglassful of sound whiskey or the like, or to go without tea or coffee, and so forth, said Smith or Jones must not be surprised if they are told more or less emphatically to attend to those details which appertain to their own affairs. We say to them, "Tell us your opinions, and welcome; but don't pretend to instruct, still less to denounce us, if we don't agree with you. I cannot drink beer, even a glass daily, or sherry, or port, or champagne, or liqueurs, without soon having to pay a penalty for taking what does not suit the constitution I have inherited. Shall I therefore try to stop my friend, the acting Editor, from taking what agrees with *him*? That's the spirit in which most of the teetotal teachers do their preaching. It is the same with doctrines of other kinds. It will be a pleasanter world (a few thousands of years hence, perhaps) when men mind their own business, and cease to proffer unasked advice to their fellow-men.

NOTICE.—In future weekly numbers of KNOWLEDGE, the answers to correspondents will occupy much reduced space. We can no longer undertake to answer all questions addressed to us, or to explain why letters intended to be published are not suitable for our columns.

REGINA *v.* WILKINSON AND OTHERS.

(*Household Journal* and *Golden Argosy*.)

To the Editor of KNOWLEDGE.

SIR,—Referring to the notice you were good enough to accord us in your impression of the 24th ult., we have received so many communications from your readers that it has been impossible to reply, individually, to them. We shall be glad, therefore, if they will regard this letter as a formal acknowledgment.

The defendants having absconded, we cannot continue the prosecution until one of the warrants now in the hands of the police has been executed. Immediately we are in a position to proceed with the matter many of your readers will hear from us more fully,—Your obedient servants, BEST & PITTS.

57 & 59, Ludgate-hill, London, E.C., Aug. 22, 1885.

Our Inventors' Column.

CHIMNEY CLIMBERS.

[Patents No. 16,164, 1884; and 3,435, 1885.]—Messrs. Brown & Porter, of Leith-chambers, Moorfields, Liverpool, have invented a contrivance for ascending and descending tall chimneys, shafts, steeples, &c., which is remarkable both for its ingenuity and its simplicity. It consists of a staging which is made to creep up the chimney, upon which it also depends for support. Fig. 1 illustrates the design for circular chimneys, which forms the subject of the first of the above-mentioned patents. The staging is of a triangular shape, and consists of an upper and a lower stage connected by vertical columns at each corner; at the left side is seen a screw worked by the handle A, which serves to give the staging a tight grip against the chimney, the two corners of the stage opposite, what we may call the screw corner, being hinged for the purpose.

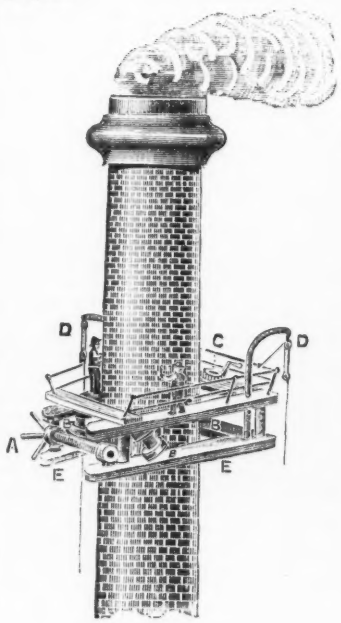


Fig. 1.

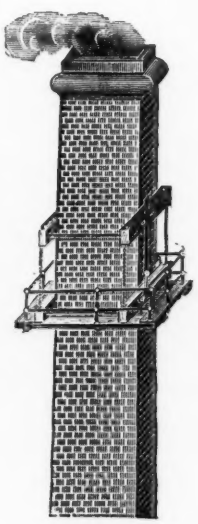


Fig. 2.

Three rollers, marked B, are provided and set at an angle, one in each side of the triangular stage; these rollers bear against the chimney, the one to the right can be turned round by means of a handle, worm, and worm-wheel, C. The effect of turning this roller is to cause the stage, as a whole, to gradually climb up the chimney with a spiral movement; of course, as the stage ascends and comes to a narrower part of the structure, it is necessary to tighten the screw, A, so as to give the rollers the necessary grip.

The form shown in Fig. 2 is simpler still, and is adopted to square, hexagonal, or any other shaped shaft. The apparatus consists of two stout timber grippers capable of being secured to the chimney to be climbed by means of two long bolts, one on each side the chimney; to these upper grippers are suspended (by means of four chains) two others precisely similar, capable also of being bolted to the chimney, and to the latter is attached the stage. The lower and upper grippers are also connected by means of two steel screws two inches in diameter. The operation of climbing the chimney is as follows:—Supposing the upper grippers to be screwed fast, and the lower ones to be loose, then the weight of the stage is being sustained by the chains; the two screws are now operated, and the stage is thereby gradually raised; when the desired height is reached, the lower grippers are secured by tightening up the bolts, which takes off the weight from the upper ones, so that the latter can now be raised to a greater height by simply working the screws the reverse way; when the chains are again tight, the upper grippers are secured as before, the lower ones released, and the operation of lifting is continued. The weight of the staging is about 11 cwt.

So simple and effective a device is sure to commend itself, fo

among the advantages pertaining to it may be mentioned:—the safety ensured to life and limb (it is said that 12 per cent. of the professional "Steeple Jacks" are killed or maimed annually); the tedious and expensive processes of kite-flying and ladder-fixing and climbing are superseded; architects, &c., can inspect the work without risk. All these are features which any one who has watched a "Steeple Jack" at work can easily appreciate, and it may be safely said that the invention has all the elements of success.

Our Chess Column.

By Mephisto.

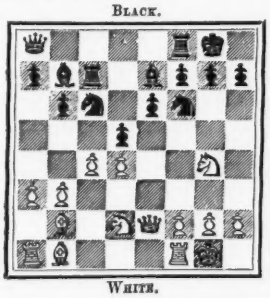
ILLUSTRATIVE GAME No. 8.

"Stronger by weakness wiser men become."

AN interesting game played in the late tournament at Hereford. Black in this game is too intent on arranging his Opening according to principles, and takes no heed of his opponent's manœuvres to mate him. We must profit by this example, and never lose sight of our opponent's designs in arranging our own.

White. Rev. J. Owen.	Black. J. Gunsberg.
1. Kt to KB3	P to Q4
2. P to Q4	P to QB4 (*a*)
3. P to K3	P to K3
4. B to K2	Kt to KB3
5. Castles	P to QKt3
6. P to QKt3	B to K2
7. B to Kt2	Castles
8. QKt to Q2	Kt to B3
9. P to B4	P × QP
10. KP × P	B to Kt2 (*b*)
11. B to Q3 (*c*)	Kt to QKt5 (*d*)
12. B to Kt sq.	R to B sq.
13. Q to K2	R to B2
14. Kt to K5	Q to R sq. (*e*)
15. P to QR3	Kt to B3
16. Kt to Kt4 (*f*)	

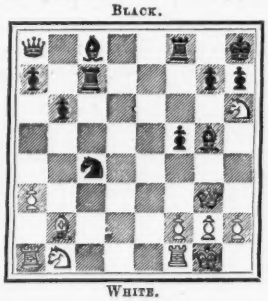
Black.



White.

White. Rev. J. Owen.	Black. J. Gunsberg.
	P × P (*g*)
17. P × P	Kt to QR4 (*h*)
18. P to Q5 (*i*)	Kt to K sq.
19. Q to K4 (*j*)	P to B4 (*k*)
20. Q × P (ch)	K to R sq.
21. Kt to R6 (*l*)	B to Kt4 (*m*)
22. P to Q6	B to B sq.
23. Q to K2	Kt × QP
24. Q to Q3	Kt (Q3) × P (*n*)
25. Kt × Kt	Kt × Kt
26. Q to KKt3	B × Kt (*o*)

Black.



White.

27. Q × R	Kt × B
28. Q to B2	B to R3 (*p*)
29. Q × Kt	B × R
30. K × B (*q*)	

NOTES.

(*a*) Rather risky to play this as second player. We have already stated in a game—Mackenzie *v.* Mason—that it is preferable to Castle before advancing this P.

(*b*) Black's play is directed against the advanced White Pawns. White cannot play P × P without isolating his QP, nor can he advance the P; whereas Black may play P × P, for if White retakes with P, he will have two unsupported P's on Q4 and QB4. Experience has shown that these Pawns are weak. These points in the position give Black a slight pull, which he may increase by massing his pieces on the Q's Pawns. For attacking purposes, perhaps B to R3 at once might have been better.

(*c*) While Black is absorbed in following up the principle of weakening White's Pawns, White attempts to prepare an attack against Black's K's side by the combination of moves such as B to Q3, B to Kt sq., and Q to B2, &c. White, however, would have done much better to play R to B sq. first.

(*d*) Apparently the Kt moves to a square from where it can easily be chased by P to R3. But this move in reality serves many purposes. Firstly, if the B remains there the Kt will take it off, which would put an end to White's designs against Black's K's side. Secondly, if B retires to Kt sq. the R is blocked in, and not available for the better defence of the QBP. Thirdly, if after the retirement of the B, White subsequently plays P to QR3, then White's Queen's Pawns are still more weakened, for after the Kt retires to B3 he will have a very good attacking square on R4, bearing both on the BP and KtP. As will be seen later on, all this was rightly forecast by Black, and came to pass.

(*e*) This is indeed unmindful of White's intention. A simple precaution such as P to Kt3 would have been advisable. Black, in a ponderous manner, made room to play KR to B sq., he also threatens the KKtP.

(*f*) A very natural desire on White's part to displace the Black Kt which guards the objective weak spot on Black's KR2. He also threatens Kt × Kt (ch) followed by P × P, in which case each side would have an isolated QP.

(*g*) This move gives Black a bad game. He ought to have played Kt to QR4 first, as originally intended, for if Q to Q3, then P to Kt3 would secure his position.

(*h*) Even now the following line of play would avoid trouble, viz., Kt × Kt. 18. Q × Kt, B to B3. 19. Kt to K4, Q to Q sq. (best), &c.

(*i*) A very fine move. Black now pays the penalty for his one-sided play. If Black replies with 18. P × P, then 19. Kt × Kt (ch) followed by 20. Q to Q3 wins. Or, if 18. Kt × Kt. 19. Q × Kt, P to Kt3. 20. P × P or 20. P to Q6 followed by 21. Q to Q4 gives White a superior game.

(*j*) Very well played indeed, and much better than 19. P × P, P to B4, &c. White gets the KP with a check.

(*k*) If 19. P to Kt3, 20. Kt to R6, mate.

(*l*) Encouraged by success, White becomes very ambitious. This is a showy continuation, especially as Philidor's mate is threatened by Q to Kt8 (ch), &c. In reality, however, Black's pieces were too well placed to allow White to get anything more now. His best move would have been 21. Q to K2. Black could not take the Kt on account of 22. Q to Q3. Against 21. Kt to K5 there is the objection that after Black moves B to Kt4 or Kt to Q3 the White Q will be liable to attack by R to K2 or B to B sq.

(*m*) A powerful move, which turns the tables upon White. Black threatens R to K2, or if the Q moves, B × KKt.

(*n*) It seems really that success has its dangers for the victor as well as the vanquished, inasmuch as it makes the former over confident in proportion as the latter puts forth his best efforts. As soon as Black escaped out of his difficulties he relaxes his attention. Here 24. Kt to Q sq. would have won the Kt.

(*o*) A simple way of liquidation. Black, however, still had a chance of playing to win the Kt by retiring his B to Q sq., protecting the R, if then 27. B to Q4, Q to B3. 28. Q to B4, B to B3, &c.

(*p*) Black had evidently overlooked that the Kt has no escape. Now B's of opposite colour remain, which leaves Black not sufficient to win. It would have made no difference if Black had played B to KKt4 instead of this move; for after 29. Q × Kt, B to B3 White would play 30. Q to Kt4, attacking the R and compelling B to R3, then 31. R to R2 would again leave B's of opposite colour.

(*q*) The game was abandoned as drawn on the 41st move.

Our Whist Column.

By "Five of Clubs."

WHIST DEVELOPMENTS.*

A CAREFUL study of "Whist Developments," by "Cavendish" has gone far to convert us to the opinion of Pembridge and others, that Whist as a game is in a fair way of being ruined. Whist developments are like fungoid growths, the signs and tokens if they are not the active agents of decay. "Cavendish" and his school seem determined to prove that those are mistaken who have said of Whist, "Age cannot wither nor custom stale its infinite variety"; for they try to substitute a series of cut-and-dried Cavendish rules for that beautiful variety which is the charm of the game. If Whist developments as developed in this book are adopted by Whist players generally, then Whist will no longer be a game. It may be a mental exercise, just as walking along a pavement is bodily exercise; but there will be no game in it.

Let us at the outset be understood as in no way detracting from "Cavendish's" claim to be considered a fine player, or even as rejecting the principles on which some at any rate of the rules he lays down in the present work are based. Although the game of his on which he has chiefly dwelt as a sample of brilliant play, publishing it in his "Principles," quoting it in his Essays, and telling us how and why J. Clay admired it, is altogether unsound,

* "Whist Developments," by Cavendish. Thos. De la Rue & Co., London.

as "Mogul" long since pointed out (see Game XXIV., in "How to Play Whist,")—the play which rendered the double grand coup necessary amounting really to a determined effort to throw the game away—there can be no question of "Cavendish's" present skill and experience in his own method of play. What we object to is the attempt to make fixed rules out of the multitudinous points of play which a fine player has to deal with in the actual game.

We say little about the chapters on the American leads. Players already know what these leads are, and are agreed that if we admit the desirability of always showing partner the length of the chief suit, Mr. Trist's system is a great improvement on the incomplete method of penultimate and ante-penultimate leads adopted before, and on the occasional use (only) of a method for showing at second or third round that five or more had originally been held in the suit. Our own belief is that this systematising of the rules for showing length has brought out more obviously than before the disadvantage of *always* showing length. It would be well, in our opinion, if the use of the methods for showing length should be regarded as indicating *more*,—viz., that there was a probability of bringing in the suit whose length was thus shown. With a weak hand, to display the exact length of a long weak suit is simply in nine cases out of ten to play the enemy's game.

However, the American leads so simplify the rules for showing length, and therefore so suit the players who prefer a system they can follow easily to one which leaves them to decide for themselves, that we may regard them as almost sure to be generally adopted; and if so, they must be followed even by those who dislike them, or otherwise there will be risk of actually misleading partner. I will therefore only remark farther respecting them, that at New Orleans their birthplace, and at New York where they are much admired, they are followed much more steadily than they are utilised. I doubt if a single American player except Mr. Trist himself, has once in a hundred games noted the meaning of cards played according to this system. Perhaps if a new system were adopted, by which each player should have a paper for noting the cards played to tricks, and time to enter all details, and to make all necessary calculations when his turn came to play, the system would work as Cavendish and Mr. Trist think it ought to work,—but as a matter of observed fact it does *not* work that way.

What we note as particularly objectionable in "Whist Developments" is the wooden series of rules laid down for what is called the "Plain-suit Echo." In the first place a case is cited from old Hoyle to show that he anticipated this modern device,—a case in which, in some mysterious way the third player is supposed to know that his partner holds a great suit when only two cards of that suit have been played, and holding Queen, Ten, Nine, and a very small one of that suit, third player retains the very small one and plays the Nine to his partner's Ace. The common sense of this is so obvious that it needs no insisting upon. You are supposed to know that your partner holds at least five, you yourself hold four, and one has fallen on your right; so only three cards lie with the enemy: it is almost certain therefore that if you retain three cards out of the five highest left, you will block your partner's great suit. Hoyle indeed definitely assigns six cards to your partner, so that you are absolutely certain to lose nothing by playing the Nine instead of the very small one, even if both King and Knave lie on your left. On the strength of such cases, Cavendish adopts as a general rule that when Ace is led, also in other cases definitely assigned, and you hold as third player exactly four cards of the suit, you should play the lowest but one. He takes no account of the fact that in many, nay in the great majority of cases, where you hold four cards exactly and your partner holds at least four but possibly more, there is no occasion to unblock at the first round, simply because there are two or more small cards among your four. Thus in the game in this week's *Field* (Aug. 22), which is intended specially to show the advantage of unblocking, the third player holds Ten, Eight, Six, and Two, and there is in reality no occasion whatever for playing the Six in preference to the Two. Amongst other points, left entirely unnoticed by Cavendish, is this, that when you know your partner can get in again, after you have taken your last trick in his suit, either by sure re-entering plain cards, or by long trumps, you need not trouble yourself about unblocking his suit. The play of third hand in such cases cannot possibly—at any rate cannot properly—be laid down to rule: it should depend entirely on judgment of the position. Of course, *more suo*, Cavendish rejoices more at being able to get out a new development than at any real advantage which the play according to his new rule may afford. It troubles him little that he is spoiling the game by knocking the brains out of it, that he is muddling the signal (insomuch that to signal our unlucky Cavendishian third player must play his lowest but *two*, and has not signalled f, giving up his plain suit echo at the second round, he plays the lowest; with other confusions), and that he is introducing a broad swarth of exceptions to the really important general rule. "Return the lowest of three": all this is a mere nothing compared with the introduction of "Another Whist Development."

Luckily there is a way in which those who have confidence enough to play according to their judgment of what is fitting, may neutralise the mischief of these weak developments; a player can let it be known,—First, that when he uses the American leads he means that he has a strong and well protected hand, as well as a suit of such and such a length; and secondly, that as partner he knows enough of the strategy of the game to determine, independently of any cut-and-dried rules, the propriety of unblocking his partner's suit, whether as third player or by discarding.

The way in which the illustrative games are given is very unsatisfactory, as in all Cavendish's works. There is nothing like the plan of the old *Westminster Papers*, of which ours is a development (improved, we think).

Mr. R. A. Proctor's Lecture Tour.

Subjects:

1. LIFE OF WORLDS
2. THE SUN
3. THE MOON
4. THE PLANETS
5. COMETS AND METEORS
6. THE STAR DEPTHS

Each Lecture is profusely illustrated.

Arrangements are now being made for the delivery of Lectures by Mr. Proctor from August onwards. Communications respecting terms and vacant dates should be addressed to the Manager of the Tour, Mr. JOHN STUART, Royal Concert Hall, St. Leonards-on-Sea.

Aug. 27, 28, Matlock-Bath; Aug. 29, 31, Burton-on-Trent.

Sept. 1, Burton-on-Trent; Sept. 2, 8, 11, 15, York; Sept. 3, 4, Bridlington; Sept. 7, 9, 10, Scarborough; Sept. 14, 16, 21, 22, Harrogate; Sept. 17, 18, Whitby; Sept. 24, 25, Ilkley; Sept. 28, 29, Derby.

Oct. 3, 17, Malvern; Oct. 31, Marlborough College.

Nov. 4, Burnley; Nov. 9, Stafford; Nov. 12, Middlesbrough Nov. 17, Darwen.

Dec. 7, 8, 9, Croydon; Dec. 16, 17, 18, 19, Leamington.

Jan. 12, Hull.

Feb. 3, Alexandria; Feb. 6, 20, Malvern; Feb. 10, Walsall; Feb. 15, Upper Clapton; Feb. 18, 25, London Institution.

Contents of No. 199.

	PAGE
Finding the Way at Sea. By R. A. Proctor	149
Thought and Language. XV. By Ada S. Ballin	150
First Star Lessons. (*With Map.*) By R. A. Proctor	152
The Philosophy of Clothing. XV. By W. Mattieu Williams	152
Our Household Insects. (*Illus.*) By E. A. Butler	154
The Great Red Spot on Jupiter. By Richard A. Proctor	156
The Young Electrician (*Illus.*) By W. Slingo	157
Isle of Wight Steam Ferry	158
Reviews	159
Chats on Geometrical Measurement. (*Illus.*) By R. A. Proctor	161
Miscellanea	162
Our Inventors' Column	163
Correspondence: Meteoric Display —Invisible Suns—Life in the Moon — Evolutionism — What Lies outside the Mechanism of the Universe?—Musical Temperament—Smell-clouds, &c.	163
Our Whist Column	164
Our Chess Column	166

NOTICES.

Part XLV. (July, 1885), now ready, price 1s. 3d., post-free, 1s. 6d.

Volume VII., comprising the numbers published from Jan. to June, 1885, now ready, price 9s.

Binding Cases for all the Volumes published are to be had, price 2s. each; including parcel postage, 2s. 3d.

Subscribers' numbers bound (including title, index, and case) for 3s. each Volume; including return journey per parcels post, 3s. 9d.

Remittances should in every case accompany parcels for binding.

TERMS OF SUBSCRIPTION.

The terms of Annual Subscription to the weekly numbers of KNOWLEDGE are as follows:—

	s.	d.
To any address in the United Kingdom	15	2
To the Continent, Australia, New Zealand, South Africa, & Canada	17	4
To the United States of America	$4.25 or 17	4
To the East Indies, China, &c. (*viâ* Brindisi)	19	6

All subscriptions are payable in advance.